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AUGUST, 1899. VOL. XIV. NO. 2.

The Geographical Journal

INCLUDING THE PROCEEDINGS OF THE ROYAL GEOGRAPHICAL SOCIETY.

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PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL.
EDITED BY THE SECRETARY.

LONDON:
THE ROYAL GEOGRAPHICAL SOCIETY, 1, SAVILE ROW;
EDWARD STANFORD, 26 AND 27, COCKSPUR STREET, CHARING CROSS, S.W.

PUBLISHED MONTHLY.] [To Non-Fellows, Price 2s.

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"Yours faithfully,

"R. U. MOFFAT, M.B.,

"Medical Officer, Uganda Protectorate."

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The
Geographical Journal.

No. 2. AUGUST, 1899. Vol. XIV.

JOURNEYS TO THE NORTH OF UGANDA.*

I.

By Colonel J. R. L. MACDONALD, R.E.

You are all aware that in June, 1897, the expedition which I had the honour to command left England for Mombasa to embark on its journey of exploration. The route into the interior from Mombasa was chosen because it allowed of our using for about 400 miles the existing railway and road facilities to Uganda; this left us only 200 miles of land communications to bring us to Lake Rudolf, which, running as it does nearly north and south, offered an excellent waterway, which we could make use of with comparatively few men by means of our steel boat. Thus from the fertile regions north of Lake Rudolf, which we meant to make our advanced base of operations, we had by this scheme only 200 miles of country to open out to enable us to maintain easy and safe communications with Mombasa and England.

Our European staff was to consist of ten or eleven officers, our escort of thirty Sikhs and three hundred Sudanese, and our transport of porters and carts to near the Ravine station on the Uganda road, and afterwards of porters and pack-animals.

In September, 1897, we arrived at Ngare Nyuki, one march from the Ravine, with our two thousand loads, and everything pointed to a successful start being made, as our arrangements had worked smoothly. Then, as you are aware, the expedition had for nine long months to abandon its own work in order to turn its whole strength in men and material to the assistance of the Uganda Protectorate, which was threatened with destruction by the revolt of the Sudanese troops.

* This and the following paper read at the Royal Geographical Society, June 12, 1899. Map, p. 240. For notes on the survey on which the map is based, see p. 202.

The causes which led to this revolt it would be out of place for me to deal with in a paper such as this, and, moreover, they have been fully dealt with in the Commissioner's report. Nor will it be necessary for me to dwell on the military operations in Uganda otherwise than very briefly, in order that you may realize to some extent how much my expedition suffered, and against what difficulties it had to contend in its further operations.

You know that one garrison after another joined the mutineers until, on October 19, 1898, the rising tide of mutiny was stayed by our hard-won victory on Lubwa's hill, when with 17 Sikhs and 340 raw Swahilis we had to face nearly double the number of trained Sudanese. Then followed the weary investment of Lubwa's while reinforcements came up from the coast, and hardly had the first of these arrived when the escape of Mwanga from the Germans and the army of disaffected that sprang up like magic around him in the west claimed immediate attention and the division of our strength.

The defeat of Mwanga in January, 1898, on the borders of Koki was just in time to enable us to concentrate once more to meet the new crisis in the East, due to the masterly escape of the mutineers from Lubwa's. The offensive was taken against these mutineers, who were sharply defeated by my forces on February 19 at Kejembo, and followed up, surprised, and disastrously overthrown by Major Harrison at Kabagambe on February 24, successes which, coupled with the disarmament of Unyoro, compelled their flight into Wakedi country, east of the Nile.

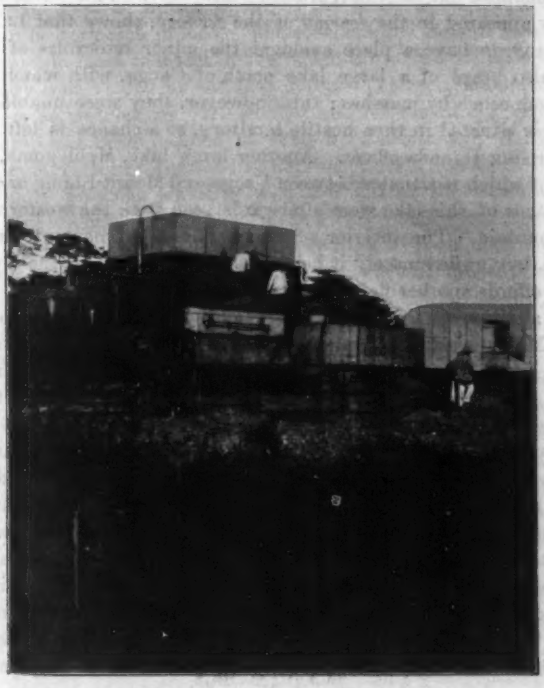
This victory allowed of our turning our attention once more to Mwanga's following, which had again rallied and caused trouble in the west; and it was not till May 3, 1898, that I was able to hand over military charge and resume the reorganization of my own expedition, with the knowledge that the Protectorate, though it would have more fighting before it finally subdued its many enemies, was itself out of danger.

During this period of anxious struggle the expedition had done more than its share of fighting, having taken part in some twenty-four fights, and lost 18 per cent. in killed and wounded, or 73 men out of the 400 engaged. Indeed, up to the end of February, 1898, some 60 per cent. of the casualties amongst the Government troops were in the ranks of the expedition, though it only supplied 30 per cent. of the fighting men. Nor was the actual loss at the hands of the enemy the only way in which the expedition suffered, for many of the officers and men had been seriously affected in health from climatic causes and the hardships of the campaign; our trade goods and stores had much decreased, and our transport, left to native supervision, had dwindled considerably during the rainy season, while the surviving animals were in very poor condition.

The Protectorate informed me that they could not make good our losses, and found that they could not spare the full escort of troops

which we required to continue our work, but seventy-five Sudanese, some cattle, and some trade goods were handed over to us.

When everything had been done, our position, as compared with its former one at Ngare Nyuki, showed what the expedition had suffered in saving Uganda. Our strength was reduced 33 per cent. in Europeans, 60 per cent. in escort, 43 per cent. in transport, and 15 per cent. in Swahilis, while our remaining trade goods would only suffice for four or



A STATION ON THE UGANDA RAILWAY.

five months, and the fresh supply ordered from the coast nine months before was blocked on the road by the reinforcements for Uganda.

On the other hand, I was fortunate in having as fine a staff of European officers as any commander could wish for, and a body of Swahilis who had learned in the best of schools—that of active service—to trust and depend on their officers and themselves.

During the fighting in Uganda geographical work had not been altogether neglected. In Buddu and Ankole the late Captain Kirkpatrick had added to our knowledge and discovered a small lake. In Bulamwezi Lieut. Bright had filled in a blank between the Maanja and Lugogo

rivers; while in the north of Chagwe and Namionjwa I had been able to rectify the existing maps. Lake Ibrahim was found to be non-existent in the form shown. During a reconnaissance in canoes on Lake Choga, I was struck by the fact that it had no land horizon on the east, and learned from the natives that it extended some 50 miles in that direction. It was not till some months later that this could be verified by a flying column under the late Captain Kirkpatrick and Captain M'Loughlin, which mapped out the configuration of the lake. This work, which has already appeared in the *Journal* of the Society, shows that Lake Choga is worthy to have a place amongst the minor reservoirs of the Nile. They also heard of a large lake north of Choga, with which it is said to be connected by marshes; this, however, they were unable to visit, as it was situated in then hostile territory, so a chance is left for some enterprising Uganda officer. Another large lake, Mpologoma, was also heard of which is situated between Usoga and Mount Elgon, and, indeed, indications of this lake were afterwards seen from the western spurs of the mountain. The interior of Usoga is not unknown to individual officers, but unfortunately it has never been mapped, so the Mpologoma region affords another field for local geographical enterprise.

In addition to this work in Uganda, I must not omit to mention what Major Austin had already completed during his journey from Ngare Nyuki to Save and thence to Mumia's, a journey during which he had not only secured new information, but had been able to correct mistakes in the work of others who had previously sketched in the country under less favourable conditions. During the first part of the journey northward from Baringo he travelled through the country of the Suk, a tribe who mostly inhabit mountainous country and dwell in little scattered hamlets of a few huts instead of in villages. They are not wholly pastoral, but their cultivation is in small patches which produce little more than is necessary for their own consumption. These patches of cultivation are often irrigated with a certain amount of skill. The Suk have always been known as good fighters who have held their own against the Masai, and, indeed, in September the expedition met a war-party of Masai who were returning after an unsuccessful raid into Suk country, where they had been very roughly handled by these hardy mountaineers.

The Suk elders candidly informed Major Austin that at first they had contemplated attacking his caravan, but that, after consideration, they thought he was too strong, and so preferred peace. The expedition evidently improved on acquaintance, as ultimately we became great friends, and the natives looked after the steel boat and its stores for some months without stealing a single bolt; and still later, when Lieut. Bright revisited Marich, the population gave him an enthusiastic reception, and got gloriously intoxicated in his honour.

Major Austin left the Suk country at Marich, and marched west

to Mount Elgon, the route at first leading along the Moroni river through a very mountainous and wooded defile, where the caravan only made good 10 miles in three long days. Once into the open grass country of the Guash Ngishu plateau, his column made better progress to Save, on the northern slopes of Mount Elgon, whence he marched to join the fighting force at Lubwa's in Usoga.

Leaving Mumia's in the end of June, 1898, we marched to Save by a route to the west of Mount Elgon, as the districts on that side were reported to be very rich in food. The southern and eastern base of this grand mountain mass, to march round which is nearly a month's journey, had already been visited by the late Joseph Thomson, Messrs. Jackson and Gedge, as well as by Mr. Hobley and officers of my expedition. The summit had been reached in 1890 by Jackson and Gedge, who found it contained a great crater-like depression some 8 miles in diameter. But the only previous traveller who had visited the western slopes was Mr. Hobley, who had in 1896 made a very plucky trip right round Elgon. He had kept at a comparatively high altitude, and found the route very difficult owing to the heavy ascents and descents over the numerous spurs. Our route was still more to the westward, with a view to avoiding so much mountain work, but even so we had to do a good deal of climbing.

One striking feature of Mount Elgon is that, while on the east it slopes down to the plain comparatively gradually, on the south, west, and north the gentler upper slopes end abruptly in a great line of precipitous cliffs, in which are situated the famous caves. On the west there is a great mass of broken and rugged ground below the cliff wall, and on the north there is a series of fertile terraces, but still the general features are as stated. The western slopes are densely inhabited by numerous small tribes of Bantu origin, who style their country Masawa. The cultivation is the most luxuriant I have seen anywhere in Africa; the hillsides are one mass of banana plantations, while in the well-watered valleys are extensive fields of grain, sweet potatoes, and beans.

Mr. Hobley found on the south that there was reported to be a tribe who lived on the upper slopes, called the Elgonyi, from whom the hill was supposed to get its name. We not only heard of the Elgonyi on the south, but also on the west and north, so I am inclined to think that the old name Elgon is more appropriate than Masawa, which is really the district lying on its western slopes.

The work of our expedition has enabled a fairly accurate map of the lower slopes of Mount Elgon to be prepared, but the more elevated parts will well repay further work both for the zoologist, entomologist, and botanist, as this mountain region appears to possess varieties and species of its own.

We had already established the most friendly relations with the tribes on the northern terraces of Mount Elgon, who are an interesting

people allied by blood with the Wanandi and Wakamasia. Indeed, I hope to show that these, with the Walako, south of the mountain, the Wakamasia, Waelgeyo, Wasuk, and Wanderobo are all fragments of a great and widespreading tribe which held the surrounding country before the advent of Masai and Bantu conquerors.

These Wasave are a well-proportioned but small race of mountaineers, not addicted to much in the way of clothing, but who make very handsome girdles and head-dresses by an embroidery of cowrie shells sewn on leather. They carry spears and large shields, and use poisoned arrows; the poison appears to be of the same vegetable type as that in use farther south, and is very fatal when fresh, and comparatively harmless when old and dry. The Wasave told us that originally their extensive cultivation extended on to the plains around Elgon, but that under pressure of more powerful tribes they had gradually been compelled to restrict themselves to the lower slopes of the mountain.

At Save, in the end of July, the expedition was organized into three columns. One of these under Major Austin carried out that portion of our work which was contemplated in the neighbourhood of Lake Rudolf. I need not say much about this part of the work, as Major Austin is himself to tell us to-night something of his experiences, but I may say that he successfully carried out the task I set him, in the face of great difficulties, and, though under most anxious conditions, has done a great deal of very valuable geographical work.

Another column was entrusted to Lieut. the Hon. Hanbury Tracy, who had to maintain our posts at Save, keep open mail communications, and organize a fresh transport corps by purchasing and equipping donkeys. This he had to do single-handed, and he did it with a success and punctuality which reflect on him the greatest credit.

The third column, under my personal command, advanced northward into Karamojo and the unknown regions beyond, which were a blank on the existing maps. Previous knowledge of these regions was practically *nil*. Mr. Donaldson Smith had seen, when north of Lake Rudolf, great grass plains stretching towards the Nile. Mr. Cavendish, from the summit of Mount Lubur, beheld range after range of forest-clad hills. Jackson, Gedge, and Hobley, from the northern slopes of Mount Elgon, had described a great swampy plain stretching to the Nile. These descriptions were somewhat conflicting. Each was undoubtedly right from their point of view, but these points were widely separated.

So much for what had been seen. What had been learned from natives was even more vague. Emin had heard of Karamojo as scarce in water and rich in camels; Martin and others that there was no cultivation in Karamojo, which was inhabited by scattered hunters; while we had information of a rich country like Kavirondo, though no two people agreed as to how to get there.

When we first left Mount Elgon, we were inclined to think that

Jackson and Hobley were not far out, for our first four marches, as we shaped our course for the eastern base of Mount Debasian, led through difficult swamps, which drained into Lake Salisbury. We afterwards discovered that by keeping still more to the east most of the swamps could have been avoided, but knowledge of this kind is often the result of experience.

Debasien is a magnificent rocky mountain, rising to several well-marked peaks, the highest of which reaches an altitude of 9700 feet

VIEW IN NANDI.

above the sea. On its upper slopes much vegetation was seen, and it is inhabited by a weak and poor tribe who are allied to the Suk, the former owners of the country. Debasien was formerly wrongly named after the district Likakisira, which lies at the foot of the mountain.

Once we passed Debasien we found the country became much drier. It was at this season fairly well watered by numerous small streams flowing to the Turkwel, and for the most part consisted of grass land, with a good deal of mimosa bush and a fringe of forest along the more important streams.

We had now a good view of another mountain, Moroto, which had an altitude of 10,000 feet, and formed an even more imposing mass than Debasien. From this mountain a range of peaks extended to the Turkwel, and we learned that this range was inhabited by the Wasuk. These peaks were very useful, as they were common to the surveys of Major Austin and myself, and thus enabled us to connect up our work and secure a cross-check.

So far we had seen nothing of any inhabitants, except a small settlement of Karamojo hunters; but on the eleventh day from Save we arrived in the highly cultivated and thickly peopled district of Manimani, which lies south-west of Mount Moroto. Lieut. Hanbury Tracy had already pushed a reconnaissance to this point, and established friendly relations with the people. And we found they were soon on the best of terms with us, more especially as we had the good fortune to bag an elephant, the meat of which made many of them happy.

At Manimani we met a Swahili trading caravan which had just returned from the north. They reported a force of three hundred Sudanese ten days distant on our proposed line of advance, and handed us a letter they had intercepted, which showed that the people were in communication with our old enemies the Uganda mutineers. This was serious intelligence, as my escort was only fifty men, and, all told, we could barely put in the field two hundred and fifty rifles. I accordingly determined to leave all our heavy baggage and transport at Manimani under a small escort, and push on with a light fighting column of two hundred rifles, to ascertain the attitude of the Sudanese before committing my heavily laden caravan to a possibly powerful hostile combination.

From Manimani our route lay west-north-west to the Karamojo district of Bukora, which was of even greater extent and more highly cultivated than Manimani. Indeed, the amount of cultivation in this part of Karamojo was very striking, consisting as it did almost entirely of millet. The river Akinyo, which rises in Mount Moroto, and flows through the districts of Manimani and Bukora, has a sandy bed 40 to 60 yards in width, and with well-defined clay banks. Water flows during the rains, and can always be found a few feet below the surface in the driest of seasons.

The Karamojo people are a magnificently developed people of great stature; indeed, they appeared to us as almost gigantic after our stay amongst the Wasave. To give some idea of this, I may mention that our Sikh escort, picked men from two of the finest Sikh regiments in India, did not look big men amongst a crowd of the Wakaramojo. The Wakaramojo have a very warlike reputation, and it was not hard to believe this well founded, since, living as they do in an open grass country in flimsy villages, and possessing immense herds of cattle, donkeys, sheep, and goats, they must be stout fighters to protect their

property. I rather fancy they are also excellent raiders, as there was a suspicious dearth of live stock amongst the weaker tribes on the borders of their country. We found them, however, most friendly to Europeans, frank and outspoken, and without exception the most honest race of savages I have ever dealt with in Africa. The people live in small scattered kraals, each of which is surrounded by a light stockade of branches. The huts are small, and are thatched in successive layers, which give them an unusual appearance. Their live stock is driven into the kraals at night, and the extremely small entrance closed with a thorn bush.

Each village or little group of villages has its own chief, but important matters are settled by a council of all the chiefs, and as there are very strict and recognized rules regarding the settlement of serious disputes, there is no fighting between these numerous settlements. In case of war against surrounding tribes, the council of chiefs elect two fighting leaders; in this respect, as indeed in many of their customs, they resemble the Masai.

The women have perhaps more latitude allowed them in Karamojo than in most African tribes, as marriage is not merely a matter of barter. If the girl objects to marry her suitor, her refusal is absolute and settles the matter. This fact naturally makes the relations of the sexes more in keeping with civilized ideas. The women are decently clothed in skins, but the men wear no clothing, unless the extraordinary felted head-dress, which hangs low over their shoulders, is classed as clothing. This head-dress has already been described by other travellers, as it is also worn by the Turkana and Suk.

A Karamojo warrior, with his felted hair-bag decked with ostrich feather, his iron collar and ivory bangles, is a very striking sight. He carries two spears, which can be used either for throwing or stabbing, a knobkerry, and a very small light shield made of hide. Many also wear a small circular wrist-knife, with which terrible wounds can be inflicted in a rough and tumble. The cutting edges of the knife and of the spear-heads are carefully protected by ingenious sheaths made of leather. Many of the customs of the Wakaramojo, like their language, are closely related to those of the Masai, and they have the same belief in one Supreme Being and in various omens, but into these there is hardly time to go at present.

From Bukora our route lay north, along the arc of a circle to Dodosi, another large Karamojo district of great fertility, and six days distant. The road lay for the most part over fine open grass plains, which swarmed with game, but in places where we threaded our way amidst small rocky hills we encountered a good deal of bush. The river-courses were mostly dry, but water could be obtained by digging or from rock pools, the position of which was known to our native guides. At Dodosi we learned that Karamojo extended northward for nearly

a degree, but that the plateau became more arid and uninhabited the farther north we got, and could only be traversed for a few months in the year.

From Dodosi, where the people were as friendly as in the south, we turned almost due west in search of food; for, though there was abundant cultivation in Manimani, Bukora, and Dodosi, the crops were not yet ripe, and grain could not be purchased.

On this western march to Gule we entered a new style of country as we neared the edge of the Karamojo plateau, which was broken by ranges of bold mountains rising from 7000 to 9000 feet above the sea. The rivers were now actual flowing streams instead of dry beds, and ran, to a great extent, through well-wooded country.

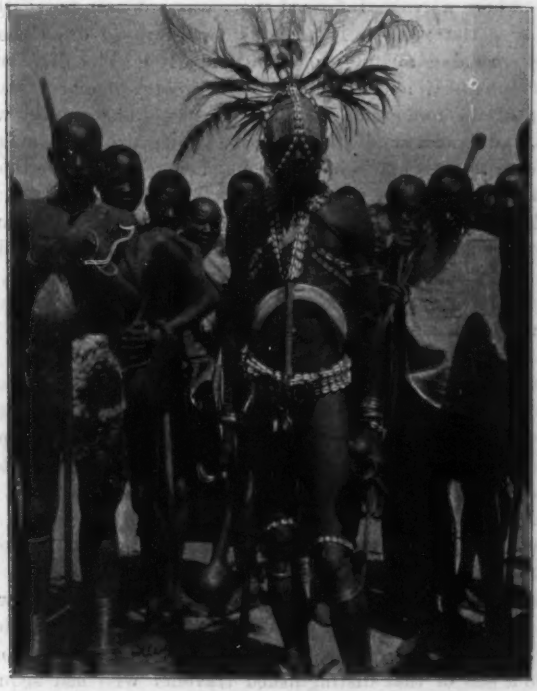
On August 21 we reached Gule, a fertile valley amidst the rocky hills of Rom, and at once sent out to invite the Sudanese to visit us. This they did on the 23rd. They halted their main body some distance from our camp, while their advanced guard with a flag and trumpeter approached us. On finding we were friendly, a call was blown on the trumpet, which was a mysterious machine made of gourds and leather, and the main body marched up in good order. There were, however, only two old Egyptian soldiers amongst them, and the remainder were trained Shulis armed with muzzle-loaders.

From these men we learned that the Uganda mutineers were beating up recruits amongst the old Sudanese who were still scattered about in this part of the world, and were located in somewhat unpleasant proximity to our further line of advance. One old ruffian calmly admitted he was an emissary of the mutineers, and had left their camp in July. Still, we had learned that these Sudanese were not formidable in themselves, and were grateful to them for bringing us a quantity of food for sale, as the local supply at Gule was insufficient for our wants. It was, however, apparent that additional supplies could be obtained from the neighbourhood, so on August 30 Lieut. Pereira and I, with most of the unarmed men and a small escort, returned to Manimani to bring up the remainder of the column and baggage, leaving Captains McLoughlin and Kirkpatrick with the bulk of our fighting men at Gule, to lay in a supply of food.

I need not trouble you with our return journey. Suffice it to say that, as we had only five days' rations with which to cover thirteen marches, we travelled fast. On September 11 we began our return march to Gule, but when we were about halfway most disquieting news came from that part. It appeared that the Uganda mutineers, reinforced by scoundrels of all sorts, were nearer to Gule than had been expected, and that hardly a day passed without their spies visiting our camp or its neighbourhood. Moreover, the local natives said they were afraid to bring us food, for fear of incurring the displeasure of the mutineers. It transpired that this was due to Jardin Effendi and seventy men

having reached a point only 20 miles from Gule, but when this warrior heard that we were the same people he had fought against in Usoga and in consequence left very hurriedly, the situation improved, and food began to come in plentifully.

However, the news led me to withdraw my advanced post to Titi, which was in the Karamojo country, where the Shuli sympathizers of the mutineers were afraid to penetrate. Titi had, moreover, the advan-



A KAVIRONDO CHIEF.

tage that it was open and healthy, and in every way was better fitted for a lengthened stay, especially as the crops were now nearly ripe, and in a fortnight there would be an abundant supply of food.

By the beginning of October the force was reassembled at Titi, and on the 4th of that month we commenced our advance to Latuka. Captain Kirkpatrick with seventy rifles remained in charge of Titi, while McLoughlin and Pereira accompanied my column, which mustered nearly two hundred rifles. We had not only the anxiety of having the Uganda mutineers on our flank, but had also learned that there was an

independent force of Sudanese in Latuka, who were thought by some to be allied to the Dervishes, and who might also be in communication with the mutineers, as we knew the latter had tried to win them over. To conceal our movements as long as possible, we chose a new route, which kept us under cover of the Nangiya mountains. At first we kept along the north-east side of these mountains, whose culminating peak is nearly 8000 feet high; but, finding that part was so overgrown with long grass as to make progress very slow, we decided to cross the range to Solian, where we were informed there was a denser population, and presumably better roads. It took us two days to cross the range, the passes reaching altitudes of 5300 and 5100 feet. We found the mountains inhabited, and that there was a great deal of cultivation by the banks of the numerous mountain-streams. The scenery was very beautiful, and from a small plateau above Solian we got a magnificent view right to the mountains of Agoro and Logire, which are the portals of Latuka.

All these peoples who inhabit Rom and the Nangiya-Solian range are Langu, but not pure Karamojo. Neither in physique nor in fighting-power do they equal this tribe, but they are friendly people, with a good idea of working in iron and of agriculture, and make use of irrigation to a considerable extent.

From Solian we pushed westwards to the isolated hills of Kiteng, where there was formerly an Egyptian post. The natives here were Shuli, but were very well disposed and anxious for us to make a stay with them. This could not be done, as it was necessary to push on. The chief of Kiteng, who had previously visited Latuka, volunteered to be our guide. Under his guidance we still kept west to Akol, another cultivated region round a small group of hills. Again we had an enthusiastic reception from the natives, who were most anxious that trade should once more visit their country.

It was a source of great surprise to these natives that I was able, from one of Smith's old maps, to now recognize some of the dominant points in the hills to the westward. Ultimately I think they concluded I must be a son of that distinguished traveller who had acquired by heredity some mysterious instinct for locality.

From Akol the route lay nearly due north to Tertenia, another great mountain nearly 8000 feet above the sea, and whose slopes were densely peopled by a very friendly and prosperous tribe. The villages were for the most part perched amidst the rocks and cliffs, and evidently the sites were selected for defensive considerations. But the amount of cultivation all along the base of the mountain was surprising, a grain called mwele having, however, taken the place of millet. The natives brought us presents of beautiful honey, goats, and fowls, and here we added to our train, as nearly a dozen men decided to accompany us to Latuka.

The country between Solian and Tertenia had been more covered with long grass and bush, and was far more trying to march through; but, on the other hand, the road was good, as there seems to be a good deal of inter-communication between the various settlements.

One march from Tertenia and we encamped in Latuka, under the shadow of Logire, a fine mountain whose summit is 8700 feet above the sea. Here we were surprised, I may say unpleasantly surprised, to see several men approaching us in the familiar Dervish jibbas. They were,

VIEW IN USOGA.

however, very cordial, and explained that, though Latuka had joined the Dervishes to save the country from devastation, and had in consequence been presented with a complete outfit of jibbas, the sultan and people would be most happy to see us, as there were no Dervishes at present in Latuka. We were also told that, owing to locusts, there was no food to be had in that country except ground-nuts.

However, there was food in Logire, so we halted a day and laid in a supply. Then we moved down the magnificent valley between the mountains of Logire and the still higher Agoro range, and that night

camped near a typical Latuka village with its high conical huts. We were at once visited by some of the village dignitaries, who wore the extraordinary Latuka head-dress, which resembles a brass helmet. These people did not wear jibbas, but when they saw our Sikhs they were much alarmed, thinking they were Dervishes, and were in two minds as to whether they ought not to go home and get into Dervish kit at once. However, they recognized that the presence of Europeans rather discounted the Dervish theory, and we were soon great friends. Next day we got amongst numerous villages, all built in strong positions, and for the most part stockaded or shut in by bamboo fences. The high-pitched conical roofs were very striking after the usual type of hut to which we had been accustomed. The Latuka warriors were also very picturesque, but we did not see much of the handsome bead head-dress which Baker describes. I suppose the fashion must have changed, as the brass-helmet arrangement was now in vogue. The arms carried are two long throwing-spears and three small assegais, the latter being very neatly worked. The shield is large and finished above with two semicircles, while the square lower end is ornamented with a tuft of ostrich plumes. A great many of the men also carried muskets, and not a few Remington rifles were to be met with, but the supply of ammunition was small.

At first the people were not inclined to let us pass, until the sultan, who has a very real power, had signified his pleasure regarding us. But their suspicions were allayed when I sent on an Arabic letter to the sultan. It afterwards transpired there was no one in Latuka who could read an Arabic letter; but that apparently did not matter, as they recognized the familiar characters, and decided we could be no others than friends.

The letter having been sent off, we proceeded on our way, and camped about 4½ miles from Logguren, the residence of the sultan's mother. That evening we heard a great drumming and shouting near Leggomen, and about 11.30 p.m. the camp was visited by five Sudanese, who were delighted to recognize old friends amongst my Sudanese escort. From them we learned that the sultan was highly gratified by our arrival, and would himself visit us next morning.

On October 21, the sultan, with an immense following, visited our camp, and we were soon on the most cordial terms. We found a few of the principal men clothed in a coarse cotton, but the large majority were naked. Every sort of trade goods was in great demand, but, as we had been warned, food was very scarce.

From the sultan we learned that the Dervishes had raided into Berri, 35 miles north, and were established at Bor, from which they have since moved in consequence of the Congolese advance. We also learned that communication on the Nile had been interrupted, and no gunboats were at Lado or even heard of. We had still in hand ten days' rations, or sufficient to get to Lado, but had not sufficient food or trade goods

to get back, even if food could be purchased there. Berri was said to be devastated, and the country east of Berri uninhabited. In the circumstances there was nothing for it but to turn back, but first we all visited Tarangole, which we found to be a considerable town about a mile long, and densely packed with huts.

The sultan showed us over one of his large huts. It had the usual high-pitched roof, and appeared to consist of a circular mud wall and a circular verandah. We found, however, that the roof was carried on the verandah posts, and that 2 feet of air-space existed between the top of the mud wall and the roof. The wall was nicely plastered, and

EMBARKATION AT LUBWA'S.

on the inside were some rude pictures done in coloured clays. One of these was a historical picture, representing the sultan riding on his state donkey.

It was interesting to compare our impressions with those of Baker. The first thing that struck us was the great dearth of cattle, and the sultan told us there were but few left in his country, though they still had large herds of goats.

Baker had noted that the Latuka people were quite different from the Nilotic tribes, and he was inclined to class them as Gallas. I noticed that most of the few words of Latuka which he gave were identical with Masai, and on making out a more extensive comparative vocabulary, I found the connection between the two languages was

well-marked. Indeed, the Latuka language showed an even closer connection with Masai than with the nearer and intervening language of Karamojo.

Our return journey need not be gone into in any length. During a portion of the way we made a *détour* by Kuron, and found a pleasant mountain country with fertile valleys, many of them well irrigated and inhabited by a friendly and prosperous population. One march was notable, as it lay through an extensive jungle of bamboo, at the low altitude of 4000 feet.

We reached Titi on November 6, to find that our post there was flourishing, that the natives were more friendly than ever, and Captain Kirkpatrick had carried out some useful exploration to the north. At this place we learned, for the first time, of the dispatch of a powerful expedition from Uganda in July, under Lieut.-Colonel Martyr, with orders to proceed down the Nile. You all know that this expedition was unfortunately stopped by the sudd.

On November 15 we began our return march to Save, but were delayed at Bukora owing to the treacherous murder of our comrade, Captain Kirkpatrick, D.S.O., and some of his men by the natives of Nakwai. His murder was promptly avenged by a punitive expedition, which taught this treacherous tribe a bitter lesson; but nothing could make up for the loss of a brave comrade who had shared in our fighting and our successes, and had repeatedly been noticed for his gallant conduct. His death could not fail to cast a gloom over our return, as he had deservedly won the respect and esteem of both officers and men.

On December 12 we reached Save, and from there commenced our return march to the coast, which was reached on March 5.

The geographical results of the expedition have been instrumental in filling in a blank on the maps between Lake Rudolf and the Nile, and in greatly adding to our knowledge of the drainage system of these regions. The most marked result was the discovery that the high and healthy plateau, known further south under the names of Mau, Nandi, and the Guash Ngishu, runs far to the northward, though at a reduced altitude. Immediately north of Elgon, this plateau is much narrowed by the extension eastward from the Nile of a great swampy depression, in which are situated numerous lakes, such as Choga, Salisbury, and Mpologoma. Northward of this, again, the plateau throws out numerous mountain ranges with a general north-westerly direction; the most marked are the Nakwai, Lobor-Agoro hills, the Nangiya-Kuron-Logire-Latuka range, and the Morongole-Harogo range. From views of still more distant mountains, whose exact position could not be determined, the same structure would appear to characterize the country still further to the north.

The western edge of the Karamojo plateau, as well as its offshoot

the ranges named, is well watered, but the plateau itself is far drier, and it is doubtless to this fact that, in spite of its lower altitude—4000 to 5000 feet above the sea—it is so healthy. Mount Elgon and the western edge of the Karamojo plateau would appear to mark the eastern limit of the double rains, while on the Karamojo plateau itself there is only one rainy season—May, June, July.

The same conditions appear to prevail further north, where the plateau cannot be crossed except in the rainy season. This, indeed, prevented our reaching the reported gold-producing oasis of Lali,

KARAMOJO HEAD DRESS.

where our Swahilis would have us believe a certain amount of English is spoken.

Another feature of this newly explored country is the great altitudes attained by its numerous mountains, varying as they do from 6000 to over 10,000 feet, and that several of the highest are as far north as the 4th degree, namely, Agoro, Logire, and Harogo.

Geologically, we cannot say much about the country, but shortly after passing Elgon we got amongst granites and schists, and in the more northern parts explored found thin beds of sandstone and extensive deposits of Kankar lime. Iron ore exists in considerable quantities, and gold is reported, though none was actually seen.

Elephants and game are very abundant. One interesting point I may mention was that the common gazelle appeared to be the Petersi, which has by some been considered a cross between the Grantii and Thomsonii. As, however, neither of these latter are found, this hypothesis would appear untenable.

One of the most interesting points was the investigation into the affinities and origin of the many different tribes encountered. The country in which our labours lay appeared to be the meeting-ground of the Bantu, Negro, and Hamitic races, and scattered amongst them were many whose classification had always been rather a puzzle. The elucidation of the grouping of these tribes is a very fascinating study, and it is to be hoped that the results we have secured, imperfect as they are, will encourage others who follow us to devote more attention to this subject.

It is not impossible, even, that the dates of some of the great migrations may be approximately fixed from a study of the different names employed for trade goods, which could have only reached them from outside sources, and whose local name would be likely to be borrowed from those sources. It is impossible, in such a paper as this, to go fully into this question, especially as we have not yet been able to completely compile our results in proper form for investigation. But roughly we may say that the tribes encountered would appear to group themselves into four main families :—

The Negro type, which has previously been investigated by others on the Nile, and which includes the Shuli, and the totally isolated offset, the Wanyipa, in South Kavirondo.

The Bantu group includes Uganda, Unyoro, and Usoga, Ketosh Masawa, and South Kavirondo. Then comes a great group of tribes which are of the same original stock as the Masai, whose origin has long been a matter of dispute. Dr. Cust places the Masai in the Nuba-Fulla group, while the Karamojo or Lango are placed amongst the Hamitic. I am not expert enough to say to which group they belong, but I can say that Latuka, Karamojo, Donyiro, Turkana, and Elgumi show so close a resemblance in customs and language with the Masai as to be undoubtedly of a common origin, and, moreover, show some connection with Galla and Somali. Strange to say, the Latuka and Masai* are more closely connected with each other than with the Karamojo subgroup, while the Karamojo, Donjiro, and Turkana have an identical language, and are amongst themselves admitted to be of the same blood.

The Masai, as far as I could gather, or to be strictly correct the Loegop, once extended from Samburu, east of Lake Rudolf, through the present Suk country to the south of Kilimanjaro. They were divided into three main divisions—Samburu, Guash Ngishu, and Masai. The Samburu are now represented by the Kore amongst the Rendile, and by

* Dr. Ravenstein pointed this out in 1884.

the people of Njemps, though they at one time occupied Lykipia; the Suk, pressed forward by the Karamojo, were driven into the mountainous country between Rudolf and Baringo, and the Samburu were thus separated and weakened. The Guash Ngishu inhabited the plateau of that name, and are reputed to have exterminated the former inhabitants, called Senguer. The Guash Ngishu, known to Swahilis as Wakwafi, and their kindred the Masai had a great war, in which the former were so weakened as to be unable to hold their own against surrounding tribes, and are now scattered dwellers in Nandi, Kavirondo, and Ketosh.

The Masai proper are the more southern of the three divisions of

CAMP AT SOLIAN.

the Loegop, and the only one which at present has any strength, though even in this case the process of disintegration appears to have set in.

There still remain various tribes which were formerly considered to be practically distinct, but these would appear, as the result of our investigations, to be broken fragments of a great aboriginal tribe which occupied the surrounding country before they were dispossessed by the inroads of the Loegop, Karamojo, and Bantu peoples. Of these the Nandi, Sotik, and Lumbwa people have previously been considered of the same stock, and to these have more recently been added the Kamasia. Similarly, Mr. Hobley established that the Wazako south of Mount Elgon are allied to the Wasave, north of that mountain, and

showed affinities with the Nandi, who again were considered to be related to the Masai. The Suk have, however, previously been supposed to be distinct, and I am not aware that any connection between these tribes and the Wanderobo, admittedly a broken people, has ever been suggested.

We find, however, when comparing the languages of the Nandi, Save, Suk, and Wanderobo, which show little connection with other recognized groups, that 33 per cent. of their words are alike through all four tribes, while 66 per cent. are common to three out of the four. This would, I think, bear out my contention that they are all branches of one aboriginal tribe, which has been broken and driven to the hills and mountains by the incursion of stronger races. And a singular confirmation of this theory is, that the dwellers on the isolated mountains in South Karamojo talk, not Karamojo, but Suk.

While thus giving a short outline of some of our work, I must not close my paper without acknowledging how much I am indebted to the officers and men I had the honour to command, who, tried and worn as they were by the hardships of the campaign in which my expedition saved Uganda, yet followed me with the same unflinching loyalty and zeal into the unknown difficulties which the legitimate work of the expedition might entail. No one could have wished for a better staff, and that the expedition was able to do so much as it did was in a large measure due to their unfailing support.

Our Sikhs have fully sustained the high reputation of their regiments. And the conduct of our Sudanese afforded one more instance of their admirable military instincts, and of the devotion to their officers, which is inspired by justice tempered with firmness.

Our Swahilis have, I am proud to think, in our hands, enhanced their reputation for pluck and endurance, and created for their race a new and striking record for soldierly qualities when led by officers they know and trust.

To the cordial co-operation of Europeans, Sikhs, Sudanese, and Swahilis, are due the results secured by the Juba expedition.

II. LAKE RUDOLF.

By Major H. H. AUSTIN, R.E.

On the reconcentration of Colonel Macdonald's expedition at Save in July, 1898, I was entrusted with the command of a column to proceed to the north of Lake Rudolf, and I propose very briefly to try and give you some idea of this portion of the exploration carried out by the expedition. An advanced food depôt had been previously established by Lieuts. the Hon. Hanbury Tracy and Bright at Ngaboto in July, and Captain Ferguson and I left Save on August 1 to join those two

officers there. The column consisted of some 160 men, which was further increased to 180 on arrival at Ngaboto. For transport purposes, in addition to our Swahili porters, we had some 90 donkeys and 14 camels. We reached Ngaboto on August 11, following generally the river Turkwell, which we struck by a cross-country route on August 6. Just before the river enters the plains to the east of the Chemorongi range of mountains, it passes through a deep gorge, and here we had to leave the river and cross the range by an exceedingly difficult mountain pass. Although this march was one of only some 10 miles, it took fifteen hours to accomplish, as it had been found necessary to unload all our animals in order to get them over the mountains. The following day the post formed at Ngaboto on the bank of the river Weiwei was reached, and here final arrangements were made for the start to Lake Rudolf. Lieut. the Hon. Hanbury Tracy was deputed to take command of the base at Save, and to organize transport to bring on food to meet me on my return journey from the north of Rudolf, and with this end in view he started for Save on August 14. Captain Ferguson and Lieut. Bright were to accompany me to Rudolf. The previous year, when at Marich, I had obtained the services of a very capable Suk guide, Nyanga by name, who had remained at our base in Save throughout the mutiny operations, and who was now to conduct us northward.

On August 15 we commenced our journey from Ngaboto, and followed the river Turkwell in a northerly direction for the first ten marches. The river Weiwei joined the Turkwell some 7 or 8 miles from our post at Ngaboto, and thence on it remains a splendid stream for several days, the bed being often 500 or 600 yards wide, but it then gradually diminishes in size before reaching the point where it makes a big sweep east at Kagwalas. The country traversed during these days was at that time an uninhabited wilderness —the soil very stony and arid, and covered with much bush and thorn. The vegetation along the river-bank itself is very dense, and elephants abound in these splendid forest retreats. To the east of the river several isolated ranges of low hills are passed, whilst to the west the Chemorongi range separates the high Karamojo plateau from the low-lying valley of the Turkwell. Many dry, sandy river-beds were crossed along the east bank of the river, but it would appear that only during periods of exceptional rain are they converted into running rivers. As we approached the big bend of the river, and entered the Ngamatak district, we once again met Turkana in large numbers. These possessed droves of magnificent camels, herds of cattle and donkeys, and numerous flocks of goats and sheep. They are essentially a pastoral people, and make little attempt to cultivate the extremely arid and sandy soil, which is incapable of producing any crops, except in a few small patches of alluvial soil in the river-bed. From Kagwalas we had two routes open

to us: (1) either to continue along the river Turkwell in an easterly direction to Lake Rudolf, and then proceed north along the lake-shore; or (2) to take a north-north-east course across a sandy desert, and strike the lake-shore higher up. As time was of utmost importance to us, we decided to adopt the desert route, and after six days of considerable hardship and sufferings, owing to the extreme scarcity of water, and grazing for the transport animals, we reached the shore of Lake Rudolf at 3° 52′ 30″ N. During this desert march we crossed several large river-beds, all of which unfortunately were quite dry, and water was only obtained by digging deep into their sandy beds. As we approached the lake the country traversed changed from undulating, open sandy plains to low hilly ground, much broken and intersected by numerous small nullahs apparently running in all directions. We were now amongst the low coast-hills bordering the western shores of the lake, and on August 31 we got our first view of this grand expanse of water across a small plain 4 or 5 miles in width, which extends from the low hills we had penetrated to the water's edge.

We camped that day for the first time on the lake-shore, at the head of a small lagoon separated from the open water by a low sand-bar, thrown up by the action of the waves. The existence of numerous similar lagoons is one of the most distinctive features of the western shores of Lake Rudolf. These lagoons are much frequented by various species of water-birds, such as whistling teal, Egyptian geese, pelicans, flamingoes, spoonbills, whimbrel, ibis, herons, egrets, and cormorants, which provided a most welcome change of diet from over-driven goat. During our journey north along the lake-shore, and later, on our return to the mouth of the Turkwell, we noticed many evidences of a westward encroachment of the lake, such as palm trees surrounded by water and partially submerged. Indeed, at one point we observed a regular line of trees, extending for a distance of between 2 and 3 miles out into the lake. We found the water far from pleasant to the taste, as it was impregnated with sodium, and in consequence scarcely appeased one's thirst. The heat was very great, as we were now only some 1250 feet above the sea, and I think Rudolf is the only part of Africa where we found the nights at all resemble the Indian hot-weather night, with which many of you are doubtless familiar. The waters of the lake, however, abound with fish, mostly of the cat-fish tribe, which provided the sportsmen amongst our porters with many a good supper; whilst crocodiles were also seen in large numbers, in addition to a few hippopotami.

The Turkana living along the lake-shore were extremely suspicious of the advent of the white men, and gave us a wide berth until our return, as they drove away their flocks into the hills bordering the lake on our approach, and only returned after we had passed their deserted kraals. These latter were of a most primitive type, merely consisting of wind-shelters of a few thorn branches for the natives,

whilst in the centre of a thorn fence the goats, sheep, and other animals were pounded for the night. We passed under Mount Lubur on September 6. Mr. Cavendish has already described it to you as an extinct volcano, with a splendid rocky escarpment below its summit. Two days later we crossed the Turkana border, and reached the district of Marle. Here we found the natives most friendly, and in the small settlements of Komogul and Lumian they had cultivated plots of alluvial soil near the water's edge, which subsequently proved the salvation of the column. Rounding the northern limit of Lake Rudolf, we camped near the mouth of the river Omo on September 12, and were all very thankful once more to get fresh water. This splendid stream is, in my opinion, the only perennial feeder of Lake Rudolf, as I have good reason to think the waters of the two large rivers—the Kerio and the Turkwell—seldom, if ever, reach the lake. The Omo is a magnificent stream from 100 to 150 yards in width, and, judging by the large volume of water flowing between its banks, I have little hesitation in saying it must rise in the highlands of Abyssinia, though I believe this fact has been disputed. It appears very deep, and I should imagine would be navigable for some considerable distance north. We made three marches up the Omo, hoping to obtain fresh supplies of food at Marle, a reported land of Goshen, as we were now almost at the end of our resources. On arrival there, however, we found the people starving and suffering from small-pox, as they had lately been raided and their country devastated. We were unable to obtain a particle of food, and were compelled to beat a hasty retreat to Lumian, where, by dint of bartering, we were at length able to purchase some seventy bags of grain wherewith to face the return journey of thirty days to Ngaboto, where I hoped to meet Lieut. Hanbury Tracy about October 22 with fresh supplies for our relief.

We left Lumian on September 24, and retraced our footsteps along the lake-shore to the point where we had first struck it. As the men were much worn by the short rations to which I had for long been compelled to restrict them, it was decided not to attempt the desert route again, so we continued south along the lake to the mouth of the Turkwell, which we reached on October 6. Our camp was only some 5 miles from the lake here, and the bed of the river at least 1000 yards wide. We halted there one day, and Lieut. Bright followed down the river-bed, which gradually diminished in size, and after a short time became lost on a sandy stretch of desert about half a mile from the edge of the lake. It appears unlikely, therefore, that, in spite of the large volume of water found in the river in the upper reaches during rainy weather, it ever reaches the lake at all. Four marches in a westerly direction along the river-bed, in which we had to dig for water, brought us to our former camp, where we had left the Turkwell to strike across the desert. We knew we were now only ten days from Ngaboto, and that place was

safely reached accordingly on October 22; but not without fighting, as for a week we were subjected to an exceedingly annoying guerilla warfare by the Turkana, bands of whom followed the line of march and made frequent attacks on the column. We were now out of food, and the enthusiasm was very great in consequence when we met Lieut. Tracy's relief column actually crossing the ford of the Weiwei river on the same day as we reached Ngaboto. After several days' rest here the combined columns returned to our base at Save—Captain Ferguson and Lieut. Hanbury Tracy proceeding over the Chemorongi mountains, whilst Lieut. Bright and I proceeded south to Marich, to return our Suk guide to his home and to complete the survey of this region. From Marich we followed the route of the previous year to Save by the Muroni river valley. We reached our base on November 12, after an absence of three and a half months, during which time we had accomplished a journey of close on 850 miles.

Before the reading of the papers, the PRESIDENT said: We have the great pleasure this evening of welcoming amongst us Colonel Macdonald and several members of his staff, who, as we all know, have done a very great service in Africa, and a very hard and difficult service. It is not every exploring party which has to fight for nine months before it can begin its work. Colonel Macdonald has led his expedition into countries which are entirely unknown to the north of Mount Elgon, and will give us a very interesting account of it.

After the reading of the papers by Colonel Macdonald and Major Austin, the following discussion took place:—

Captain PRINGLE: This is the first occasion, I think, we have had the pleasure of hearing Colonel Macdonald tell us something of his exploration work in Africa, and there may be some here to-night who perhaps do not know that Colonel Macdonald has done other and as valuable work in former years as that he has told us of to-night. In 1891 he went out in charge of the Uganda railway survey. He never has had an opportunity of telling us of the work he did in connection with that survey, but the railway is now working along the line that he surveyed, and I think that, though he has very modestly not said anything about it, we shall all be glad of this opportunity of expressing our admiration of his railway survey work in East Africa. I should like to mention one point in connection with the exploration work of other and famous explorers, more particularly in respect to Captain Speke. Colonel Macdonald has not referred to Captain Speke's work, but I think that he and other African explorers recognize, considering the instruments and material at Captain Speke's disposal, how extraordinarily accurate his work was. I should like to mention one other point about Colonel Macdonald's work. Next Monday we are to hear a lecture by Captain Smith, who was with the late Captain Sclater on the construction of the cart-road between Mombasa and Uganda. I believe those two officers of the Royal Engineers carried on a trigonometrical survey between the coast and Lake Victoria Nyanza. I think you will recognize the accuracy of Colonel Macdonald's work when I say that the result of that survey is to show that the position of Mumia's, 600 miles from the coast, as fixed by Colonel Macdonald in 1892, is within a few hundred yards of the position determined by this more accurate trigonometrical survey.

Mr. ERNEST GEDGE: I must confess it is with diffidence I rise to address you, as

it is so many years since I had the pleasure of seeing Africa. In 1890, in company with my friend Mr. F. J. Jackson, I ascended Mount Elgon, and from there we surveyed, or rather looked over, the country which Colonel Macdonald has been fortunate enough to traverse for the first time. Much as we should have liked to have prosecuted our investigations further, we were unable to do so for many reasons. In the first place, the hostility of the natives was very great; there was famine everywhere round about, and there was no water. I wish to bear tribute to the cordial relations which I have always had with Colonel Macdonald in the days of old in Uganda, and to the universal respect in which he was held as an officer, and as a man able to lead men.

Major MAXSE: My expedition, under the Sirdar's orders, was made last December up the Sobat river, which flows into the Nile 80 miles above Fashoda. Our object was to take over the region of the Sobat (which was formerly held by the Egyptians), and to communicate, if possible, with Colonels Martyr and Macdonald in the upper Nile and in the Lake Rudolf district.

I sent off several letters in December, 1898, and, for all I know, these may be still wandering about the country in charge of various naked black gentlemen on the look-out for the gallant colonels. But, as Colonel Macdonald has just told us that he quitted the Latuka country in October, the chances are he may never receive my interesting communications. Of course, you will not expect me to tell you much about the Sobat district in a five minutes' oration, especially as I came here without a suspicion that I should be called upon to address you. The river undoubtedly affords us a fine waterway into the country. Our gunboat, the *Abu Klea*, navigated the Sobat for nearly 300 miles, and also one of its southern tributaries for another 108 miles, viz. to a point 320 miles from the Sobat mouth, on the Nile.

I calculate that the *Abu Klea* was between 150 and 160 miles from Bor when she reached the farthest navigable point of the above-mentioned southern tributary, called the Pibor. Onwards towards Bor the country consisted of marsh land and grass land, without a visible hill or the sign of a habitation. There is but one cluster of villages on the Pibor river, containing some six to seven thousand inhabitants of the Nuer tribe, with whom we entered into friendly intercourse. They have no communication with any tribes to the south. You will thus realize how difficult it was to get even a letter across to the upper Nile. To have organized a land expedition of sufficient strength to be of any use to our friends from Uganda would have required time, careful preparation, and quantities of supplies in such a barren land. Bor was reported to be occupied by 1000 dervishes under Arabi Dafalla.

In conclusion, I may say that there is still a wide field for further exploration in the Sobat district, which is well populated between the Nile and Fort Nasser, where we established a garrison.

The tributary marked "Juba" on most existing maps must have been put in by hearsay, as nothing like it exists. However, Major Capper mapped the whole country which our expedition traversed above Nasser; the maps are already in print, and they will doubtless soon be in your hands. I understand that previous to our visit the Pibor had never been explored or mapped, unless a flying visit of the French in 1898 was enabled to map a portion of it.

Colonel Sir THOMAS HOLDICH: I think, from what we have heard to-night, that we may all very well congratulate ourselves on having Colonel Macdonald here to receive our congratulations. We have waited for him so long; dimly and vaguely we have watched the operations of that little party which he commanded in that far-off country, obscured as they have been by the mists of distance, and sometimes

even by the smoke of those remote battlefields, and I think I may say this—whatever may have been the interest with which we have followed the march of the victorious armies from Cairo to Khartum, our hearts and sympathies have been quite as much with that little band of Europeans, Sikhs, and Swahilis who first of all had to save a kingdom, and then make their way northwards to the Nile, as with the heroes of Atbara and Omdurman. To-night Colonel Macdonald has given us an outline of what he has seen. It is but an outline, and we shall have to wait with patience until the time comes when he will be able to fill it in with the details of that mass of scientific information he has gathered together. There are one or two things which I should like to refer to. It is hardly the time, and this is not the place, in which to refer to those thrilling episodes that hang about the story he has yet to tell of his unequal fight with a savage foe, well armed and well disciplined. We have seen a good deal of that sort of fighting lately in other countries—some in India; and although this is no new phase in the art of war, there are new developments in it that will give our military leaders some trouble and food for reflection. I wish to call your attention to the importance of the geographical discoveries made by the party under Colonel Macdonald. The discovery—we may accept it as such—of the extension of that Abyssinian watershed (the same which we crawled slowly down from Annesley bay to Magdala in 1868), an extension in the form of a plateau 5000 to 6000 feet high, bordering those huge swamps, which are so closely packed with vegetation as to make it impossible to navigate them; this must have an important bearing on our future communications in Africa. What the rôle of that watershed may be hereafter in the general scheme of African railways, it is impossible to say, but it is bound to be an important one. I should like to say a word or two, also, for those scientific survey methods which have been introduced by Colonel Macdonald into this strange land of mountains, deserts, and forests. The early explorers laid down a ground-plan, which had to be filled in by practical engineers, railway-makers, road-makers, miners, and general civilizers who have followed after them. Their methods and their system of geographical survey were not in all respects adequate for present requirements. Africa is such a vast country, and there is before us now such a vista of boundary settlements and land agreements to be made there, that we cannot afford any longer to be inaccurate in our geography. Thus it is a great thing to be able to welcome a somewhat new departure in this respect. The ultimate and ideal basis of a general survey of Africa, which every surveyor would wish to see, is a geodetic triangulation. This does not exist at present, and it certainly will be many years before it does exist; but, meantime, there are methods which, properly applied in skilful hands, will answer all practical purposes if duly recognized and properly attended to. It is exactly in the application of these methods that the scientific training of such men as Colonel Macdonald and Major Austin comes in. They have shown us once again in Africa that, no matter whether fighting or exploring, whether marching daily by rapid marches or sitting still, it is always possible to keep in touch with scientific accuracy in the matter of geographical map-making. There is one point which has struck me during the reading of Colonel Macdonald's paper. It is impossible, it seems to me, for any officer who is burdened with the responsibilities of leadership to be his own topographer. He cannot, in addition to his other duties, undertake the daily grind of making maps. For this he ought to be dependent on some trained agency which may be applied to that object, and that alone. Such we have in India in the native surveyors of the Survey Department. They have gone far and done well, even beyond the borders of Asia, and, so far as I know, they have always done good work. I have never heard anything but good of them. It is just such a school as this that is wanted in Africa. Here again

we must look to trained engineers of the stamp of Colonel Macdonald and Major Austin to initiate and support the scheme. Once again I say it is difficult to appreciate, by the light of this one evening's discussion, the magnificent work which Colonel Macdonald has succeeded in accomplishing. Colonel Macdonald and Major Austin and the gallant men with them may not, perhaps, claim the honours of first discoverers, such honours, that is to say, as were won by Speke, Grant, Baker, and Livingstone; but their names will at least stand high on the later roll of fame as African workmen, a roll of which England may very well be proud, for it includes the names of Gordon, Kitchener, and Lugard.

The PRESIDENT: It remains for us to pass a vote of thanks for the paper that has been read to us this evening. I am sure we must all have been struck by the remarkable steadfastness with which Colonel Macdonald and his staff have worked until they had accomplished what they intended to do. You will remember, I think, not much more than a year ago, how Mr. Cavendish told us of the extensive view he had attained from Mount Lubur of the region between Lake Rudolf and the Nile, and how it appeared to us to be an utterly unknown country. Well, Colonel Macdonald and his officers have traversed that unknown country, have discovered its characteristics, have measured its mountains, and had intercourse with its people. It must be a great satisfaction to them to have completed such excellent work. There, of course, is one great drawback in the loss of their companion, Captain Kirkpatrick. I remember well his coming to me before he went out, and what zeal and enthusiasm he showed for the task. Now Colonel Macdonald has told us that that zeal and enthusiasm were coupled with excellent work in the field. He was a clever surveyor, and an admirable commander of men. I cannot help expressing my deep sympathy to his family, with whom I am acquainted, for the loss they have sustained, and we have all heard how deeply it has been felt by Colonel Macdonald, his commander, and by his companions. Otherwise the expedition seems to have been an entirely happy and successful one. The work along the west side of Lake Rudolf to the river Omo was most complete, and has resulted in the laying down of that side of the lake by accurate survey. The examination of the mountains between that lake and the Nile has also been most valuable. We must all congratulate Colonel Macdonald and his gallant and zealous companions on the completion of their most arduous labour, and I am sure you will all unanimously pass a vote of thanks to him for his paper this evening.

THE SWEDISH ARCTIC EXPEDITION OF 1898.*

By Prof. A. G. NATHORST.

WICHE'S LAND.

In what I have said up to this point, I have avoided the delicate question how far King Charles Land is to be identified with the land which the Englishman, Thos. Edge, alleges to have been seen in 1617 to the east of Spitsbergen, and which he calls Wiche's Land. The identification of the two has been strongly maintained by English geographers, whilst Petermann in his day as stoutly disputed it. The story of the discovery of Wiche's Land, which was communicated by Edge himself, is

* Map, p. 128. Continued from p. 76.

recorded in the second chapter of the third book of Purchas.* Edge was at that time commodore of the English flotilla which the Muscovy Company despatched every year to Spitsbergen (although then called Greenland). The salient passage (p. 467) runs as follows:—

"They also employed a ship of sixtie tunnes, with twenty men in her, who discouered to the Eastward of *Greenland*, as farre to the Northwards as seuentie nine degrees, and [?] an Iland which he named *Witches* Iland, and diuers other Ilands as by the Map appeareth, and killed stores of Sea-horses there, and then came into *Bel-sound*, where he found his lading of Oyle, left by the Captayne which he tooke in."

From this passage, as well as from the context, it is plain that Edge himself did not see the reputed land. The accompanying map (see Fig. 17, a reduced facsimile) represents Wiche's Land as a coast extending over two and a half degrees of latitude in a north-south direction. In reply to Petermann's observation, that Wiche's Land has not on this map the same position as King Charles Land, it has been said that "the error of the draftsman in placing the land too far south is corrected in the accompanied text of Purchas; and this fact destroys the last shadow of an excuse for altering the name."†

For my own part, I should not hesitate one moment to use the English name, if I were only convinced that the English opinion answered to the real facts. But as it is, I have been forced to the very opposite conclusion. Instead of the text serving as a corrective of the map, it actually refers us to the map as its authority, saying, "as by the Map appeareth." Indeed, according to my interpretation of the text, there does not exist any discrepancy between the text and the map, for I believe it only to be meant that the newly discovered land extends northwards, as far as about the 79th parallel. And in this interpretation I am strengthened by what I read with regard to the discovery of Edge Land in the year preceding: "They imployed this yeere a small Pinnasse vnto the East-ward, which discouered the East-ward part of Greenland, Namely, the Iland called now *Edges* Iland, and other Ilands lying to the North-wards as farre as seuentie eight degrees." But, as will be seen from the map, the southern extremity of Edge's Land lies on 77° N. lat., and it is to be assumed that the land which was discovered by the "pinnasse" extended at least as far north as 78° N. lat.

Be this, however, as it may, it was the most natural thing in the

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* 'Purchas his Pilgrimes,' pt. iii. London. 1625.

† 'Ocean Highways,' New Series, i. (1873–74) p. 19. The controversy may be read in *Petermanns Geographische Mitteilungen*, 1873, p. 129; and 1874, p. 38, note 2; *Proc. Roy. Geog. Soc.*, vol. xvii. (1872–73) p. 97; 'Ocean Highways,' *loc. cit.*, pp. 19, 34, 465. The March number of the last-cited work for the year 1873, which is also said to throw some light upon the matter, is, unfortunately, wanting in our Swedish libraries.

world for the English geographers, when they learned that Von Heuglin had discovered a large extent of land lying to the east of Spitsbergen, and between 78° and 79° N. lat., to regard this as identical with Wiche's

FIG. 17.—PUECHAS'S MAP OF SPITSBERGEN AND WICHE'S LAND.

Land. But the accuracy of their identification was obviously very greatly weakened by the observations made in 1872, by which it was shown that the King Charles Land of Von Heuglin did not exist, and that the real King Charles Land (of Mohn) is considerably smaller than the reputed Wiche's Land. Unfortunately, Kükenthal's map, upon which the latest English Admiralty chart has been constructed, by making Swedish foreland three times the size it ought to be, lends a fictitious support to the English identification. We now know, however, that Swedish foreland is not more than 11′ (lat.) long, or, in other words, stretches in a north-south direction only about one-fourteenth of the distance which is assigned to Wiche's Land on Edge's map, and that at a different longitude; and therewith vanishes the last glint of likelihood that King Charles Land is identical with Wiche's Land. Nor must it be overlooked that Wiche's Land, as depicted on Edge's map, presents a totally different outline from the real contours of King Charles Land. To identify the two, therefore, is, in the light of these difficulties, impossible.

What, then, is Wiche's Land? Scoresby thought * it was the same as Ryk Yse's islands. But this is scarcely likely, for Kükenthal has shown that these islands are exceedingly small—in fact, considerably less than they were generally believed to be. Possibly it was a mirage which gave rise to the mistake, similar to that which misled Birkbeck and Von Heuglin and Von Zeil, and which originated the long discussion as to the relation between King Charles Land and Wiche's Land. In this connection it is important to remember Payer's mistake with regard to Franz Josef Land, a mistake which came near to costing Nansen dear. Now, if mistakes of this kind could be made in these present days, and made by experienced explorers, it is readily conceivable that they may have also been made in former times, and this despite the strange prejudice which leads men to believe that the older an account the more trustworthy it is. On the whole, there is no impossibility for concluding that the seamen who were under the impression that they saw the so-called Wiche's Land, were in reality the victims of an optical illusion.

All the same, there does exist another assumption, and it is this, that Wiche's Land and Edge's Land may be the same. The latter was discovered in the year 1616, and on the map is placed much too near to West Spitsbergen (Greenland). Now, it is not inconceivable that, if in the following year another seaman discovered to the east of West Spitsbergen land which lay too far to the east to agree with the pretended position of Edge's Land, he should naturally conclude it was not the same, but an entirely fresh discovery; and, as a matter of fact, the outline of the coast of Wiche's Land does bear a certain resemblance to the

* 'An Account of the Arctic Regions' (Edinburgh), vol. i., Appendix No. 3, p. 62: "1617. Wiches Land, afterwards named by the Dutch Ryk Yse's islands, discovered by one of the English whale-fishers."

east side of the Great fjord. In that case, the sound on the map which almost divides Wiche's Land would obviously be that which on Edge's map is called Ald. Freman's inlet.

There is also another circumstance in the map published by Purchas which seems to favour this hypothesis, namely, that the three islands which are there shown to the south-south-west of Hope island have no actual existence. If, however, we accept the hypothesis that Wiche's Land and Edge's Land are one and the same, it becomes quite easy to account for their appearance on Purchas's map, for they then simply correspond to what are now called the King Ludwig islands. However this may be, it is abundantly clear that for the future the name Wiche's Land must disappear from our maps.

Map-making of the 1898 Expedition.

The map of King Charles Land, which was laid down as the result of the labours of the Swedish Polar Expedition of 1898 (see *Ymer*, 1899, pl. 1, and the map accompanying this paper), was drafted by the official cartographer of the expedition, Lieut. O. Kjellström. Swedish foreland is mapped from Lieut. Kjellström's own survey with plane-table, levelling telescope, and offset pole, which he used in the course of a peregrination of the entire island. He also measured in the same way the western upland region of King Charles Land, as well as the eastern portions around Mount Johnsen and westwards as far as Timmer ness. The low grounds in the middle of the island, as also Abel island and other small islands, were laid down through the photogrammetrical method by Dr. A. Hamberg. The latter likewise took and calculated all the astronomical determinations we made, and determined the variation of the compass both upon Swedish foreland and upon King Charles Land.

The altitudes are based partly upon observations with Elfving's mirror, made by Lieut. O. Kjellström, and partly by barometrical observations taken by Messrs. Hamberg, G. Andersson, J. G. Andersson, and the writer of this paper. With regard to the former set of observations, it should be stated that they seldom give the highest altitudes of the tableland, for the simple reason that these were not visible from the places from which Lieut. Kjellström took his observations, but the difference cannot be great. The dotted contours of the small islands and the low-lying portion of the coast were only seen from a distance; hence it seemed desirable to distinguish them from those portions of the coastal outline which are laid down from actual measurement. I dare say such errors as exist in these dotted stretches of coast will not eventually be found to be very serious.

Since this paper was originally written, but before the map which accompanies it was printed, I have seen Captain Rüdiger's account of

the German Lerner expedition.* Thus I am able to incorporate in my map the names Helgoland island and Tirpitz island. But Rüdiger's Mount Emmy and Mount Martha are the same as Hårfagrehaugen and Mount Johnsen respectively. Rüdiger's altitudes are without exception erroneous. Whilst on the one hand he makes several elevations twice as great as they ought to be—for instance, Mount Mohn 1500 to 2000 feet, and the western side of King Charles island 1300 to 1500 feet—on the other hand he puts Mount Johnsen at only 350 feet, or less than one-half of its real height.

Since the maps of the Swedish expedition of 1898 were laid down partly by the older method, employed by Lieut. Kjellström, and partly by the newer photogrammetrical method, employed by Dr. A. Hamberg, it may not be out of place to add a few words as to the way in which these two methods are used in relation to one another. I cannot but consider it fortunate that we had gentlemen on board who were capable of using both.

At both Bear island and Swedish foreland it was found impossible to employ the camera, because of the prevalence of mist. Had we been confined to the photogrammetrical method alone, we should consequently have been doomed to disappointment. As it was, we were fortunate enough to obtain excellent results with the old-established instruments. The results obtained by this method are very reliable, and after taking a clean tracing there remains little more to be done. On the other hand, the work in the field is very much more laborious than by the newer method, and consequently it takes a proportionally longer time to get the map completed. It was, therefore, fortunate for us that during the time of our stay at King Charles island we enjoyed days sufficiently clear to admit of excellent photographs being taken of the low grounds of the interior, as well as of the small islands round the coast. Afterwards the weather became so changeable, that it is extremely doubtful whether we should have been able to lay off such a dangerous coast long enough to allow of the island being surveyed by the more usual method. If you are not pinched for time, and can afford to wait for fine weather, the photogrammetrical method is by far the more convenient, although a considerable time must necessarily elapse afterwards before the map can be finished. We mapped the whole of Van Keulen bay in Spitsbergen by this method. If you are making a reconnaissance, and are obliged to do your best no matter what the weather is, you cannot dispense with the older, slower method; but if you are also equipped with camera, etc., you can take advantage of any fine days that may chance to come, and in that way can in a few hours accomplish as much as could be done in several days with the plane-table and other surveying-instruments.

* 'Allgemeines über den Verlauf der Expedition nach dem europäischen Nordmeer an Bord des Dampfers Helgoland,' in *Verhl. d. Gesch. für Erdkunde zu Berlin*, XXV. (1898), p. 430.

Geography of King Charles Land.

As will be seen by a glance at the map, the framework of Swedish foreland consists of a tableland or plateau, stretching in a general north-south direction throughout the island. Its southern end, culminating in Mount Nordenskjöld (Fig. 18) is tolerably broad. The plateau is capped with basalt, resting upon sedimentary strata (sand, sandstone, and clay) of the Jurassic system, which become visible in the steep slopes which front the ocean at the southern end of the island. The highest altitude on this plateau, by barometric measurement, is 625 feet. Going northwards, the plateau gradually contracts in width to a narrow ridge, the Keel (Kölen); this again, as it advances to the north, widens out into the plateau of Mount Dunér (755 feet), which is separated

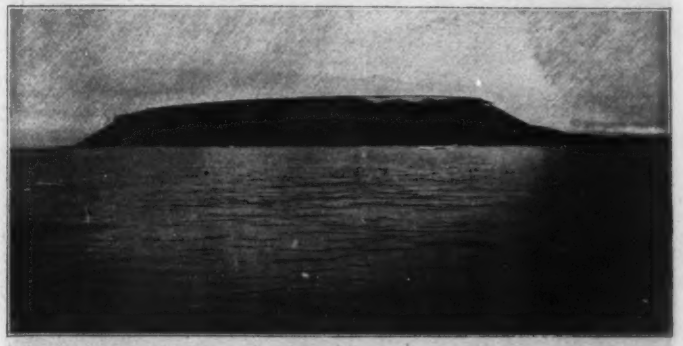


FIG 18.—MOUNT NORDENSKJÖLD, ON THE SOUTH SIDE OF SWEDISH FORELAND.
(*From a photograph by O. Kjellström*)

from Mount Mohn (730 feet) by a depression. To the south of the Keel there exists a permanent cap of snow and ice, the Oval ice-cap. Except for this, and for the patches of snow which cling permanently to the upper edges of the plateau and the higher slopes of the hills, the island is tolerably free from snow. As I have already had occasion to remark, Kükenthal erroneously supposed that a snow-drift which he observed on the west side of Mount Nordenskjöld was a glacier. Lieut. Kjellström, however, reported the existence of an undoubted glacier with moraines on the east side of the island; on my map I have named it Kükenthal glacier.

As the snow-drifts melt, the water trickles down to the lowlands on both sides of the island, the low grounds on the east being relatively of considerable extent. These low grounds consist chiefly of sand and clay washed down by the rivulets, and, being marshy, are not easy to traverse. At Cape Weissenfels there exist veritable sand-dunes, a

somewhat strange phenomenon in the arctic regions. Of the raised beaches along the shore, and the great quantities of driftwood, I shall speak later.

Unfortunately, Swedish foreland does not possess any sheltered anchorage or port. As for the *Antarctic*, she was anchored in 7½ fathoms of water to the south of Cape Weissenfels, where she was to some extent protected against the northerly winds. The sea-bottom there was fine sand. According to the reports of sealing skippers, when the wind is in the south, it is possible to anchor on the north side of Cape Weissenfels. There is also believed to be an anchorage near Cape Pettersen. I thought there would be good anchorage between Cape Hammerfest and the little island of Antarctic which we discovered, but I was

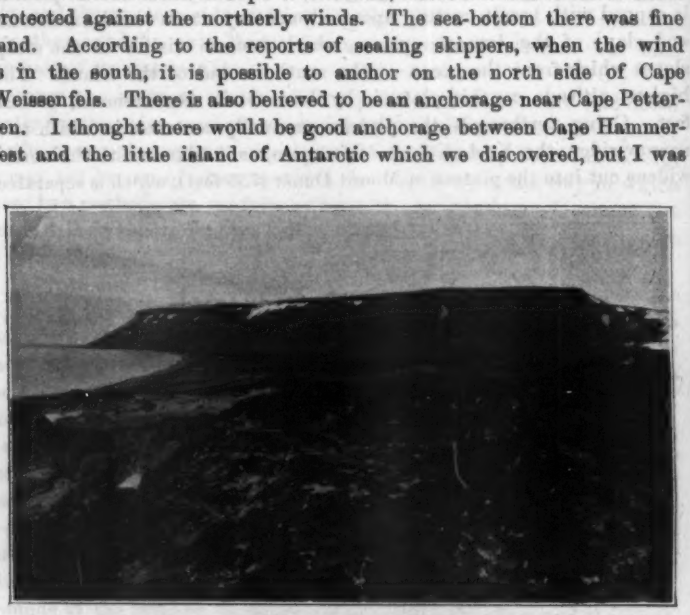


FIG. 19.—MOUNT SJÖGREN, SEEN FROM CAPE ALTMANN, LOOKING WEST.
(*From a photograph by O. Kjellström.*)

mistaken. The water was too shallow to allow of a vessel with such a deep draft as the *Antarctic* approaching sufficiently near to the island. No doubt sealing sloops and smaller craft might count upon sufficient shelter there, but they would have to proceed with great caution, and employ the lead constantly. Unfortunately, we were unable to take any soundings of real value.

King Charles island may be said to consist of three separate main portions—the western plateau or uplands, Mount Johnsen in the east, and the lowlying intervening ground between the two. The western plateau embraces three distinct parts—(1) Mount Sjögren (Fig. 19), which forms the southern side of the western end of the island; (2) Mount Tordenskjold (Fig. 20), separated from the former by the pass opposite to Cape Altmann, and running up on the north into the

similarly shaped Mount Retzius; and (3) Hårfagrehaugen, which stands isolated. Mount Sjögren is very narrow, especially as compared with Mount Tordenskjold.

To the geologist the history of the island is an open book. It is plain that these flat-topped mountains are the survivals of what were formerly extensive plateaus, and that they owe their survival to the great resisting power of the basalt as against the destructive agencies of erosion and disintegration. The basalt has played here the same *rôle* as the diabase on the summit of Kinnekulle, etc., in Sweden; it forms a protective cap to the soft and easily destructible sedimentary rocks which underlie it, and which, but for its protection, would long ago have entirely disappeared. The sedimentary sands, clays, and clay-

FIG. 20.—MOUNT TORDENSKJOLD, SEEN FROM CAPE ALTMANN, LOOKING EAST.
(*From a photograph by O. Kjellström.*)

slates belong to the Jurassic system, and we found in them a considerable number of fossils, both plants and animals, belonging to different subdivisions of the system.* Mount Mohn and Hårfagrehaugen, which have a certain resemblance to one another, have been separated from the plateaus adjacent to them by erosion. The latter is more completely detached than the former, for Mount Mohn is still connected in part with the plateau which lies to the south of it. Mount Johnsen, which stands isolated at the eastern extremity of the island, is built up in the same manner as the other plateaus: its summit consists of basalt, resting upon Jurassic strata richly fossiliferous. These capping

* I propose to publish in another place a detailed account of the geology of King Charles Land.

basalts were originally lava-flows, in the vesicular hollows of which crystals of agate, calcedony, rock-crystal, calc-spar, etc., have been formed. It is also possible that warm springs highly charged with silicic acid, the after-effects of volcanic outbreaks, have been the active causes of the petrifaction of the fossilized wood, which occurs so plentifully in conjunction with the basalt beds. The basalt is also met with in the form of dykes; *e.g.* Cape Altmann is one such dyke, and it is continued in a series of submarine ridges for a considerable distance seawards. For this reason, great caution should be observed in approaching the coast in this place.

The difference in altitude between the several plateaus cannot be said to be great, though the average elevation of the plateaus of King Charles island is higher than the average elevation of the plateaus of Swedish foreland. Mount Sjögren is about 820 feet high. Mount Tordenskjold reaches 460 feet in the south, but northwards runs up to 945 feet (or, according to the barometer, to 995 feet). Mount Retzius, with which it is connected, attains a yet greater altitude, viz. 1050 feet (barometric measurement); whilst Hårfagrehaugen is at least 1005 feet high. The mean of four independent barometrical observations gives the altitude of Mount Johnsen as 755 feet.

There exists a large snow-drift on the plateau of Mount Tordenskjold, on the east side, or rather it existed at the time of our visit in the early part of August; except for this, the tops of the plateaus of King Charles Land were, strange to say, almost entirely free of snow. But on their slopes, immediately underneath their edges, there exist several patches of snow, some of them, *e.g.* on the western versant of Mount Tordenskjold, a few miles long.

Apart from a few isolated rocks of basalt, the lower grounds are composed of disintegrated materials brought down from the hills and rearranged by the sea. These disintegrated materials consist of sand and stony clay, and, above all, of pebbles of basalt. Indeed, terraces of rounded basalt pebbles are conspicuous everywhere, but are especially strongly developed at Cape Hammerfest, on Swedish foreland, and throughout almost the whole of the lower grounds of King Charles island. Both Johnsen and Pike have called attention to these ancient marine terraces, which, I may add, occur as high as 715 feet above the present level of the sea, and traces of their former existence are met with at even higher altitudes. This is an extremely interesting fact, because, so far as has been observed hitherto, the changes of level which have taken place in Spitsbergen do not reach above half as high. Another remarkable circumstance in connection with these ancient marine terraces—a circumstance duly pointed out by Johnsen and Pike—is the occurrence of driftwood at considerable altitudes above the present level of the sea. We observed driftwood at a level of at least 130 feet above the ocean; and, by the way, this affords striking evidence

of the slow rate of decomposition in those high latitudes, for the drift-wood which lies at such a great height must be several thousand years old. In a few places we saw lying on these marine terraces, and also up on the summits of the plateaus, erratic blocks which had been transported thither by drift-ice; they were sometimes of granite, sometimes gneiss, or quartzite, and on the lower eastern part of King Charles island white limestones belonging to the Permo-Carboniferous Age, similar to those which prevail in certain mountains that overhang Hinlopen strait in Spitsbergen.

According to J. G. Andersson, there exists a small glacier on King Charles island, on the southern slope of Mount Tordenskjold; but possibly it is a "dead" glacier. In the immediate vicinity, the investigator discovered some striated stones. This glacier and Kükenthal glacier on Swedish foreland were the only two glaciers that we observed, though there existed other evidences of former glacial activity on King Charles island. But with regard to this, I intend to publish an account elsewhere.

As on Swedish foreland, so on King Charles island, there exists a small ice-cap, the Round ice-cap. The former was crossed by myself and Hamberg, the latter by Hamberg alone. The process of thawing which they were undergoing presented more than one feature of interest, such as cylindrical melting-holes (cryoconite holes) of different sizes, though these are also found on other permanent snow-drifts. When we visited King Charles Land, it was the time of year when the red and green snow was beginning to show itself. The latter variety seemed to me to be especially prevalent where the substratum consisted of inorganic materials. At least I never saw the snow so deeply stained with green as I did in a certain locality on the east side of Mount Nordenskjöld on Swedish foreland, and in another similar place on the east side of Mount Tordenskjold on King Charles island, and in both places the green snow rested on an inorganic base.

King Charles island, too, appears to lack good harbours. Our first anchorage was in Broad bay, on the east side of Cape Altmann, quite close to the shore, in $6\frac{1}{2}$ fathoms, and there we were, to some extent, sheltered from the north and west winds. But the bottom being fine sand, the anchorage was not of the best; in fact, the blasts from the north sometimes swept over the hills with such violence that the shelter became entirely illusory. We also cast anchor in Antarctic bay, to the west of Cape Altmann, in 6 fathoms of water; but there too the "holdfast" is only sand, though more shelving. The whole of Broad bay is full of islands and shallows. Although the bottom of Andrée bay is of clay, yet it was so deep—33 fathoms quite close to shore—that we did not venture to let drop an anchor, but lay to. Still, it might be possible to find a better anchorage in that bay. Whether there exist any more convenient anchorages in the small bays on the north side of the island,

I am unable to say. It might be worth while to examine some of them, *e.g.* Holm bay, with a view to finding out this.

The higher plants are but scantily represented in King Charles Land, although there were a few places which presented a very agreeable contrast to the prevailing barrenness. The flora embraces but few species. The three botanists of the expedition found hardly more than about a score of phanerogams altogether. Their names, and the localities in which they were discovered, are indicated in the subjoined list, extracted from the *Proceedings* of the Royal (Swedish) Academy of Sciences (1898, p. 555).

List of Phanerogamous Plants found in King Charles Land by the Swedish Polar Expedition of 1898. By Gunnar Andersson and Henrik Hesselman. (Certain of the particulars hereafter recorded are due to Prof. Dr. A. G. Nathorst.)

1. *Saxifraga nivalis*, L. On Swedish foreland, as well as King Charles island.
2. *Saxifraga nivalis*, L., var. *tenuis*, Wg. In dry places. This variety, like the type of the species, occurs on both islands.
3. *Saxifraga stellaris*, L., var. *comosa*, Poir. In moist places. On both islands.
4. *Saxifraga oppositifolia*, L. On both islands.
5. *Saxifraga rivularis*, L. In various localities. On both islands.
6. *Saxifraga cernua*, L. In large numbers at Cape Weissenfels, in the east of Swedish foreland; also thinly scattered over both islands.
7. *Saxifraga decipiens*, Ehrb., var. *cæspitosa*, L. On both islands.
8. *Cardamine bellidifolia*, L. A few solitary examples on both islands.
9. *Draba* sp. Scattered thinly over both islands. Perhaps two separate species.
10. *Cochlearia fenestrata*, R. Br. Occurs on both islands. Especially abundant at the sandy Cape Weissenfels, in the east of Swedish foreland. Several varieties.
11. *Papaver radicatum*, Rottb. (*P. nudicaule*, L.). On both islands, in full bloom.
12. *Ranunculus hyperboreus*, Rottb. On the marshy ground at Cape Hammerfest, in the south of Swedish foreland, and in the vicinity of Broad bay on King Charles island. Not found in flower.
13. *Ranunculus sulphureus*, Sol. On both islands.
14. *Stellaria longipes*, Goldie, var. *humilis*, Fenzl. On both islands.
15. *Cerastium alpinum*, L. On both islands.
16. *Cerastium alpinum*, L., var. *cæspitosa*, Malmgren. On both islands.
17. *Alsine rubella*, Wg. Only a few specimens at Cape Hammerfest, in the south of Swedish foreland.
18. *Sagina nivalis*, (Lindbl.) Fr. At Cape Weissenfels, in the east of Swedish foreland.
19. *Polygonum viviparum*, L. In the south of Swedish foreland.
20. *Salix polaris*, Wg. On both islands.
21. *Poa flexuosa*, Wg. On both islands.
22. *Poa* sp. From the sandy Cape Weissenfels, in the east of Swedish foreland.
23. *Catabrosa algida*, (Sol.) Fr. On both islands.
24. *Alopecurus alpinus*, Sm. On both islands. Occurs in various localities, and often of luxuriant growth.
25. *Luzula arctica*, Blytt. On both islands.
26. *Luzula arcuata*, (Wg.) Sw., subsp. *confusa*, (Lindeb.) Hartm. At Cape Weissenfels on Swedish foreland, and beside Broad bay, in King Charles island.
27. *Juncus biglumis*, L. On the north side of King Charles island.

No species of vascular cryptogams were found. A more detailed description of the general botanical relations of the archipelago, especially of the exceedingly interesting flora of the sandy shore and the sand-dunes of Swedish foreland—a flora that has not been observed anywhere else in such high arctic latitudes—is reserved for another occasion.

Here I may add that *Silene acaulis*, which Mohn, on the strength of Johnsen's description, assigns to this archipelago, is undoubtedly *Cerastium alpinum*, var. *cæspitosa*. Future explorers will no doubt discover a few other species; still, I do not think they will find that many have been overlooked by our expedition.

The drift-sand flora of Cape Weissenfels is indeed of very great interest. In no part of the arctic regions have I seen the mountain poppy either so fully developed or so profusely in bloom as I saw it in Swedish foreland. In one place a tolerably large hill was so closely carpeted with its yellow flowers, that at the first glance I thought it was a new variety of stone, different from the varieties in the vicinity. As is generally the case, the hillsides and the level ground immediately at their feet offered the richest flora. As Mr. Pike pointed out, the terraces of basalt pebbles are almost entirely destitute of plants of the higher orders; in this respect they resemble the so-called "stone-fields" of Sweden.

The chief features of the mammalian fauna and the avi-fauna of King Charles Land were described by Johnsen; since his time, contributions have been made to our knowledge of this department of science by Kükenthal and Pike. The polar bear, arctic fox, and reindeer were named as the three principal terrestrial mammals; but the reindeer would now appear to be extinct. In 1872 Johnsen shot, on the east side of King Charles Land, "a buck, which for the region of Spitsbergen was of an unusual size, and had a magnificent crown of antlers," and on the surface of both snow and bare earth he perceived numerous tracks of reindeer and their calves. In 1889, Hemming Andreasen shot three reindeer on Swedish foreland; but since then, so far as is known, no reindeer have been seen on any of the islands of King Charles Land. I do not know whether they have been exterminated by the sealers, for of their doings we possess no records. If not, what is the cause of their disappearance? For the present this question cannot be answered. We came across reindeer horns in many places on both King Charles island and Swedish foreland; and on many of the permanent snow-drifts on the plateau in the latter island, we observed reindeer droppings in such quantity as to justify the assumption that reindeer must formerly have frequented the island in considerable numbers.

We saw the arctic fox on both islands, though only a few individuals. We shot three polar bears. Lieut. Kjellström, however, saw several on Swedish foreland, but was prevented by his duties from pursuing them.

Their tracks were visible everywhere; but as only a few days before a German expedition had slain no fewer than twenty-eight full-grown animals and captured four young ones, it was not surprising that there were but few left. The holes which the bears made in the snow were almost invariably on the upper slopes, immediately below the brink of the plateau. Their droppings consisted of grass and other vegetable matter.

Johnsen mentions three kinds of seal—the great seal, little seal, and Greenland seal. The presence of the latter will, of course, depend upon the presence of drift-ice. We saw no Greenland seal. To these may be added the walrus, of which some were killed by the Norwegian whaling skippers. Mr. Hamberg found a skull of a walrus in a raised beach at Cape Weissenfels.

Johnsen enumerates ten species of birds as existing on King Charles Land; Kükenthal mentions nine, and of these two are not contained in Johnsen's list. Kolthoff's list, on the other hand, embraces eighteen species; and if to these we add the long-tailed duck, which Kükenthal observed on June 24 about 6 nautical miles from King Charles Land, we get the following species:—

I. Those which certainly do breed on the islands—*Plectrophanes nivalis*, *Tringa maritima*, *Anser* sp. (presumably *brachyrhyncus*), *Somateria mollissima*, *Colymbus septentrionalis*, *Uria grylle*, var. *Mandtii*, *Lestris crepidata*, *Rissa tridactyla*, *Larus glaucus*, *L. eburneus*.* That geese visit the archipelago was proved by an old egg-shell which I picked up on the eastern slope of Mount Johnsen, and by their droppings, which we observed in various localities; but the birds had migrated to other regions before the period of our visit.

II. The following possibly breed in King Charles Land: *Somateria spectabilis*, *Harelda glacialis*, *Lestris Buffoni* (on Swedish foreland), *Sterna arctica*, and *Charadrius hiaticula*.

III. The following do not breed in King Charles Land: *Lestris pomarina*, *Fulmarus glacialis*, *Uria Brünnichii*, and *Mergulus alle*.

As regards insect life, it must suffice to mention the occurrence of midges (*Chironomus extremus*, Holmgr., according to Prof. Chr. Aurivillius) and Podurids (glacier fleas, etc.).

* Mr. Pike speaks of this species as breeding on Cape Weissenfels. It is, therefore, an error on the part of Captain Rüdiger to say that the Lerner expedition, which discovered the ivory gull nesting on Abel island, was the first to note the occurrence of the bird on King Charles Land. Kolthoff found the ivory gull nesting at several other places besides Cape Weissenfels; for instance, on Mount Sjögren and Mount Retzius on King Charles island. We found the ivory gull also breeding on White island. Mr. Jackson, too, has reported the existence of a large breeding colony on Cape Mary Harmsworth, in Franz Josef Land; and Captain Kjeldsen saw great numbers breeding on an island off Cape Oppolzer, in the same archipelago (see *Ymer*, 1898, p. 240).

Conditions of Ice.

I ought not to omit some mention of the conditions of the ice at King Charles Land. As I have already said, the condition of the ice to the east of Spitsbergen would seem to have been exceptionally favourable in the summer of 1898. During the whole period of our visit of King Charles Land, the sea was completely free from ice. It is true that in the end of June, the ice to the east of Edge's Land prevented us from approaching King Charles Land; but some weeks later that ice was so far diminished that on August 3 the *Antarctic* was able without difficulty to cut her way through it, and this notwithstanding that on the day before the *Princesse Alice*, belonging to Prince Albert of Monaco, was stopped by it in 77° 30′ N. lat. and 26° 5′ E. long.* All the sealing skippers to whom we spoke were agreed that they had never seen so little ice to the east of Spitsbergen as in the year 1898.

Each of the immediately preceding years was also favourable in regard to the relatively small quantity of ice in the same region. This was particularly the case in the latter part of the summer of 1897, when Mr. Pike sailed from King Charles Land and came down the east side of Spitsbergen without meeting any ice; and in the same year, when the *Windward* fetched the Jackson expedition from Franz Josef Land, she was able to steam almost in a straight line from Cape Mary Harmsworth to Bear (Beeren) island.† In certain years in the eighties, too, the ice would appear to have presented unusually favourable conditions —for instance, in 1884, 1886, and 1889; and the same thing was true in 1872. But previous to the last-mentioned year, the ice conditions were of a very different character. What that was cannot, perhaps, be more succinctly expressed than in the words which an old Norwegian arctic navigator once used to me: "At the time when I used to sail to Spitsbergen, we never thought of going to the east of that island; it was looked upon as absolutely impossible."

From this it would appear that during recent years the ice conditions of those waters have changed considerably for the better. Whether, if we were to go still further back in the century, anterior to the period to which the old Norwegian skipper was referring, the ice conditions were better again, I cannot venture to express any opinion. It would be an interesting study to gather together the various reports as to the condition of the ice to the east of Spitsbergen which have come down to us, and see how far from them it would be possible to draw any conclusions as to the changes which have taken place, and whether there exist any grounds for inferring that those changes have been in any

* *Comptes Rendus de la Soc. de Géogr. de Paris*, 1898, p. 344. From Rüdiger's account (*loc. cit.*), it would appear that the *Helgoland*, with the Lerner expedition on board, encountered no traces of ice whatever to the east of Edge's Land on July 22 and 23.

† See the map, 'Routes in the Spitsbergen-Novaya Zemlya Seas,' in the April number of this *Journal*, 1898.

respect periodical, or have moved in any definite direction. In default of such information, it would be idle to speculate as to the causes of the diminution in the quantity of ice which has taken place during recent years, as well as to attempt to draw any inference with respect to the future.

Giles Land.

It was originally my intention, upon leaving King Charles Land, to proceed to Franz Josef Land in search of Andrée and his companions; for when we put in at Advent bay, we were told—incorrectly, as it subsequently proved—that Wellman, making for the same destination, had been unable to get through the ice. Then on August 12 we spoke the steamship *Frithjof*, and were told by Captain Kjeldsen, that he had thoroughly examined the whole of the southern portion of Franz Josef Land as far as the ice would allow him. He had visited Mr. Leigh Smith's house and also Mr. Jackson's without discovering any traces of Andrée. Under those circumstances, much as I should personally have liked to make a trip to Franz Josef Land, I deemed it advisable to desist. I could not do anything more for Andrée than had been already done; moreover, the season was getting on, and we should run a risk of being caught in the ice to little or no purpose. Leaving King Charles Land, therefore, on the night of August 17, I thought it wiser to make for White island, or Giles Land, farther to the north.

Early on the morning of the 18th, we became aware of a peculiar vault of light, as it were, gleaming through the mist. As the morning advanced, this glittering brightness took on more and more the appearance of land; and the likeness was all the greater because we thought we could observe a perpendicular ice-wall at its foot. But the atmosphere grew thicker, and as it thickened what we took for a fractured ice-edge we believed now to be land, far, far away in the distance, and the light which we had noticed appeared to be nothing more than a cloud above it. But this was an error; all at once the mist parted, and there before us lay White island in all its remarkable beauty (Fig. 21). And of a truth rightly was it named; for it was glittering white from its highest summit down to the very edge of the sea. It was covered throughout with its soft mantle of snow; not a rock projected through it to break its spotless purity. The island rose in regular curves to an altitude of 600 or 700 feet, and was one continuous mass of ice and snow. The ice plunges down into the sea all round the island, and is quite inaccessible, being abruptly broken off at the water's edge, thus presenting a steep wall of ice to the waves, and forming in some places big cubical icebergs. I was instantly put in mind of Nansen's description of Hvidtenland, which White island no doubt resembles, as it also apparently resembles, though of course in miniature, the steep ice-walls of the antarctic continent.

The weather was wintry, with squalls of snow, and unfortunately never quite clear. With the sun shining upon it, White island must be a fascinating object. It is considerably larger than previous maps represented it to be, for we steamed alongside it all the afternoon and all the following night. In the evening we succeeded in effecting a landing on its extreme north-eastern point, where the precipitous ice-wall drew back and left a strip of shore free. But our landing had nearly proved disastrous to our good vessel; for whilst the boat party was absent, the drift-ice set in strongly towards the land. We only just escaped being caught fast in it. And on the following morning, when I went on shore on the south-west extremity of the island, the drift-ice again threatened to cut us off from the vessel. The promontory

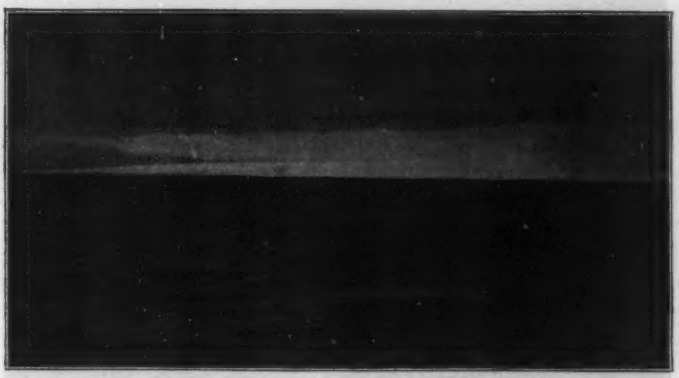


FIG. 21.—GILES LAND, OR WHITE ISLAND.
(*From a photograph by A. Hamber.*)

upon which I landed was low, and consisted of granite and gneiss. On the low ground contiguous to it a great crowd of ivory gulls had their breeding-places.

It scarcely admits of doubt that White island is the land which Commander Giles saw in 1707. It lies on precisely the same latitude as the Giles Land of Van Keulen's map; the difference of longitude is not a matter of any moment.

Circumnavigation of Spitsbergen.

Having completed the circumnavigation of Giles Land on August 19, we pushed further to the north; but the ice grew rapidly more and more difficult, so that we were obliged to keep close to its edge and incline to the north-west. We had every reason to congratulate ourselves upon having such a stout vessel; with one less strong, we should have fared but ill. Our greatest difficulty came shortly after midnight on the

20th; but the *Antarctic* behaved splendidly: her stout prow cleft a sure road through the ice, and in the morning we reached King Charles XII. island (Fig. 22) and open water. This island is the extreme outpost of Spitsbergen towards the north-east, and has a fine appearance with its steep sides and truncated top. To the south of it lies a smaller island, the Drabant. The coasts of both islands were strewn with great quantities of driftwood.

After exploring these two islands—the kernel consists of primary rocks—we once more pushed on to the north, till we reached 81° 14′ N. lat. There we encountered the solid pack-ice—"the firm ice"—a compact, absolutely impenetrable mass. That was the highest latitude we

FIG. 22.—CHARLES XII. ISLAND.
(*From a photograph by A. Hamberg.*)

reached. Had it been a few weeks earlier, we might have penetrated a considerable distance further towards the north. But for some time past the wind had been blowing steadily from the north, driving the pack-ice before it. After sounding, we turned and followed the edge of the ice towards the south-west.

The rest of the voyage may be told in a few words, as we had to do with places that are sufficiently well known. We kept to the west of the Seven islands, and, putting in at Treurenberg bay, remained two or three days in Hecla cove to overhaul and clean the boilers. Upon starting again, we made for Grey Hook, and then steering north-west till we met the pack-ice again in 80° 18′ N. lat. Thereupon we returned to Grey Hook, and thence steered for Virgo harbour, in Danish island.

There we made a vain search for dead carrier pigeons of Andrée's expedition, and filled up our water-tanks. Andrée's balloon-house was blown down (Fig. 23); still it was interesting to have seen the cradle, as it were, of a method of exploration which will no doubt be more extensively employed in the future. We next took a sounding north-west of Amsterdam island, and then turned our prow southwards, and on August 28 intersected our previous course of July 25, thus completing the first Swedish circumnavigation of Spitsbergen.

On the following day we were caught in a furious tempest, the wind having a velocity of 65 feet in the second. This threw us forty-seven minutes west of our true course. We put the *Antarctic* under close-

FIG. 23.—REMAINS OF ANDRÉE'S BALLOON HOUSE, DANES ISLAND.
(*From a photograph by O. Kjellström.*)

reefed topsail and fore-stay sail, and it was a real pleasure to see how splendidly she weathered the heavy seas. I should like to have gone into the Great fjord for a few days' geological field-work, but the storms succeeded one another thick and fast; winter had set in, so that in the end I judged it wisest to make for home. We passed Bear island on the afternoon of September 3, and thence steered straight for Tromsö, sounding and making hydrographical studies as we went. Upon putting into Tromsö on the morning of the 7th, we found nearly all the arctic sealing-fleet already arrived before us.

SKETCH OF THE SCIENTIFIC RESULTS OF THE EXPEDITION.

In the foregoing summary description of the course of the expedition, I have not been able to do more than touch *en passant* upon the scientific

work that we were able to accomplish. I will, however, endeavour to gather up some of the most important results, in so far as they have been already worked out or are of general interest. It will, of course, be some considerable time before all the material we brought home with us is duly digested and tabulated.

Speaking first of the *geographical* results, I may mention the mapping of Bear island, Bel sound, and King Charles Land, as well as the nearer determination of the extent of White island. Henceforward it would be desirable that this last should be known as Giles Land, which has thus, as it were, been definitively rediscovered. Nor was *geology* neglected. Bear island proved a particularly valuable field, yielding unexpected results of great value. King Charles Land was thoroughly studied, because its geology is of special interest as forming a connecting-link between Spitsbergen and Franz Josef Land. The geology of Spitsbergen was completed. We brought home with us numerous and comprehensive collections of specimens of rock and fossils.

Our *botanical* collections were not less complete. They embraced materials for the herbarium as well as specimens preserved in alcohol and formaline. To the botanist King Charles Land was hitherto a *terra incognita*, so that the collections we brought home from that group of islands possess a unique and valuable interest. Here I may also mention that we brought home numerous specimens of red snow and green snow, of soils, and of plant-seed. From Advent bay we sent home to the Botanical Garden of Stockholm fifty-two species of living plants, and these happily all arrived in good condition. We carried out biological investigations of the flowers, and studied the relations of different plants to temperature, moisture of the air, intensity of light, and so forth, as well as took a great number of botanical photographs. In conjunction with our botanical collections, I may here add that we brought home with us a large quantity of *driftwood*, gathered from various localities which we visited. Fig. 24 shows in what abundance driftwood occurs in some places.

Our *zoological* collections of both mammals and birds will, it is hoped, form the nucleus of an Arctic Biological Museum, which it is proposed to form, so as to afford the public an opportunity of studying arctic animal-life in the actual forms. Our avi-faunal collections are, I believe, very complete and the best preserved of any that have ever been gathered in those high latitudes. It is much to be hoped that this project of an Arctic Biological Museum may be eventually realized, because in probably less than a quarter of a century several forms of arctic animal-life will, it is to be feared, have become extinct.

Our zoologists made numerous interesting observations on the habits of life of the birds. In this place I will confine myself to saying that the female of the broad-nebbed swimming sandpiper (*Phalaropus fulicarius*) flies away from her nest as soon as she has laid her eggs, and

leaves the duties of incubation and the rearing of the young to the male. Agreeably with this, the plumage of the female is much handsomer than that of the male. The female of the purple sandpiper (*Tringa maritima*) likewise leaves her young ones, so soon as they are hatched, to the care of her mate.

With the trawl and scraper we obtained specimens of the deep-sea fauna in forty-two different stations, from depths varying from a few fathoms down to 10,335 feet. The results are very extensive, and embrace several forms of great interest.

As is well known, within recent years a good deal of attention has been directed to the study of plankton, the micro-organisms of the

FIG. 24.—SHORE OF AMSTERDAM ISLAND COVERED WITH DRIFTWOOD.
(*From a photograph by G. Andersson.*)

ocean, partly because of their own intrinsic interest, and partly because they form the principal food of the herring. During the course of the voyage we took close upon 150 specimens, most of them from the surface, though some came from depths between 1500 and 6900 feet, the greatest depths from which plankton has hitherto been taken in arctic waters.

In so far as our *hydrographical* labours were concerned, I have already adverted to our fresh soundings in the Swedish deep, proving that the previous soundings were in error in giving too great a depth for that part of the Northern seas. Altogether we made twenty-four different soundings, and collected specimens of the sea-water at each. One noteworthy result of this work was the evidence we obtained, that

at the present time the Gulf Stream seems to be spread out relatively wide and deep. I have already stated that we found it to be prevailing to the bottom in the entrance to Ice fjord. The same thing was also observed north of North-East Land, in 81° 14′ N. lat.; the water was 35°·6 Fahr. at the bottom of the sea—500 feet deep. With the view of ascertaining something of the extent and direction of the current of the Gulf Stream, we threw nine hundred bottles with printed post-cards into the sea; of these about a score have already been found on the coasts of Denmark, Norway, and Spitsbergen.

Magnetic investigations, including the determination of the variation of the compass, were carried out in more than half a score places.

Throughout the voyage *meteorological observations* were taken with self-registering barometers (barographs) and thermometers (thermographs), as well as with anemometers.

A unique series of experiments were made by the doctor of the expedition, who, on every favourable opportunity, carried out *bacteriological investigations*. He filtered the atmosphere in a score of different localities on Bear island, Spitsbergen, and King Charles Land, altogether a total of 4400 gallons; but in all this quantity he did not discover a single bacterium, and only an infinitesimal quantity of aspergillus, or mould. The salubriousness of the atmosphere in the polar regions has been long known; but this is probably the first time it has been systematically and exhaustively studied on the spot by an experienced bacteriologist. Nor did the doctor confine his investigations to the atmosphere; he also examined the fresh water, snow, and ice, as well as sea-water drawn from the depth of 8860 feet. The fresh water is not entirely free from bacteria, though they are present in infinitesimal quantities, about one bacterium in every 11 cubic centimetres (= 0·67 cubic inch). In the sea-water the quantity of bacteria appeared to increase directly with the depth. The bacteriologist further examined the intestinal contents of a number of different animals, but without, generally speaking, discovering any traces of bacteria. In the intestines of the polar bear and the seal he found a species of bacteria closely resembling that which exists normally in the intestinal canal of man; but, with the one exception of the burgomaster gull, every species of bird that was examined was entirely free of bacteria.

NOTE.

OBSERVATIONS UPON THE MAP OF KING CHARLES LAND WHICH ACCOMPANIES THIS PAPER.—The map was originally laid down on the scale of 1 : 100,000, but it was judged sufficient to reproduce it here on the scale of 1 : 250,000.

In August, 1898, the variation of the compass at Cape Weissenfels, on Swedish foreland, was 1° 20′ W., whilst at Cape Altmann, on King Charles island, it was 2° 4′ E.

MEMORANDUM ON WICHE'S ISLANDS.

By Sir Clements R. Markham, K.C.B., President, R.G.S.

1617. "They also employed a ship of sixtie tunnes, with twenty men in her, who discovered to the eastward of Greenland, as far to the northwarde as 79°, an Island which *he* named Wiche's Island, and divers other Islands (as by the map appeareth") (Purchas). When the first person is used, Purchas is copying the report *verbatim*; but when Purchas begins with the third person, he is making an abstract in his own words.

The above words are *not*, then, written by Captain Edge himself, but by Purchas, with the report of Edge before him, of which he gives a meagre abstract. This, unfortunately, was the custom of Purchas, owing to want of space, instead of giving the full texts of reports.

The *he* is no doubt Captain Edge, or one of his captains, who commanded the ship of sixty tons, and discovered Wiche's Land in 79° to the east of Spitsbergen (then called Greenland).

It is Purchas, not Edge, who refers to the map, for which he is solely responsible, and which places Wiche's Land in a latitude differing from that given in Edge's report as quoted by Purchas. The size and wrong latitude of Wiche's Land on the map are merely blunders of Purchas's draughtsman. The quotation from Edge's report proves, beyond doubt, that he or one of his captains discovered land in 79° N. to the eastward of Spitsbergen, which he named Wiche's island.

The name ought, therefore, to be retained. The practice of changing and ignoring old names is strongly to be deprecated. It is unjust to the memories of early explorers, it destroys valuable historical landmarks, and it causes much confusion.

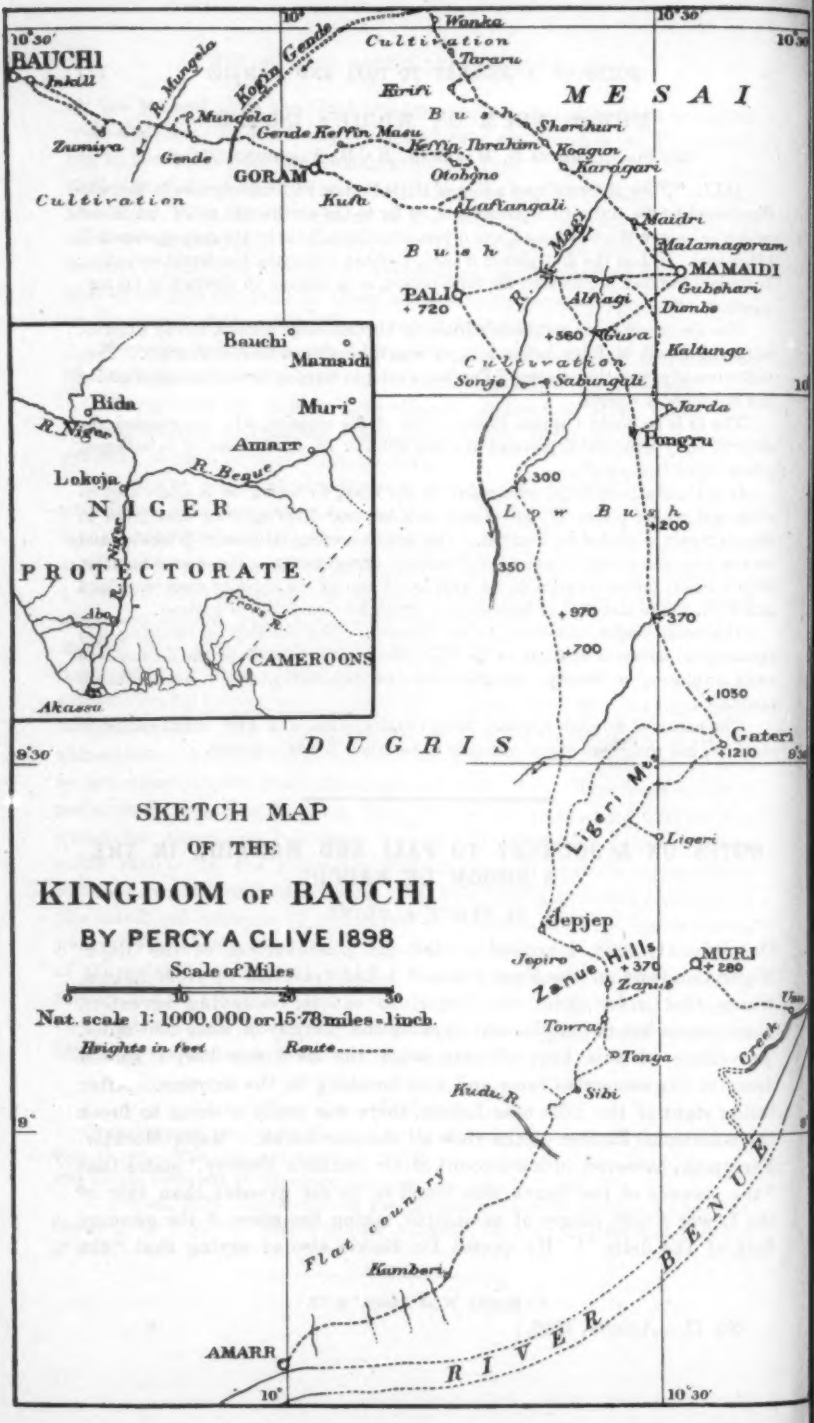
The names of Swedish foreland, King Charles island, and Abel island should be retained, but the group ought certainly to be called Wiche's islands.

NOTES ON A JOURNEY TO PALI AND MAMAIDI, IN THE KINGDOM OF BAUCHI.

By PERCY A. CLIVE.

On July 11, 1898, I arrived at Ibi, the headquarters of the Royal Niger Company on the river Benue. I had travelled up from Lokoja, where that river joins the Niger, in canoes, occupying seventeen monotonous but not unpleasant days on the journey of some 230 miles. Travelling at this time of year, when the river was low, I should describe the scenery as tame and uninteresting in the extreme. After losing sight of the hills near Lokoja, there was really nothing to break the wearisome flatness of the view all the way to Ibi. Major Mockler-Ferryman, however, in his account of Dr. Baikie's journey,* states that "the scenery of the Benue was found to be far grander than that of the Lower Niger, ranges of mountains taking the place of the swampy flats of the delta"! He quotes Dr. Baikie also as saying that "the

* 'British West Africa,' p. 73.


SKETCH MAP
OF THE
KINGDOM OF BAUCHI
BY PERCY A CLIVE 1898
Scale of Miles
0 10 20 30
Nat. scale 1: 1,000,000 or 15·78 miles = 1 inch.
Heights in feet
Route
BAUCHI
Inkall
R. Mungela
Kopin Gende
Wanka
Cultivation
Tararu
Kirifi
MESAI
Bush
Sherihuri
Mungela
Gende Kaffin Masu
Kaffin Ibrahim
Koagon
Karagari
Zumiya
Gende
GORAM
Otobono
Cultivation
Kufa
Laflangali
Maidri
Malamagoram
Bush
MAMAIDI
R. Mafi
PALI
+720
R.
Alfagi
Gubehari
Dumbe
+560
Gura
Kaltunga
Cultivation
Songe
Sabungali
Jarda
Pongru
300
Low Bush
200
350
970
370
700
1030
Gateri
1210
DUGRIS
Ligeri Mts.
Ligeri
Jepjep
Jepiro
Hills
+370
Zanus
MURI
+280
Zanus
Tonga
Creek
Kudu R.
Sibi
Flat country
Kumbari
AMARR
RIVER BENUE
Bauchi
Mamaidi
Bida
Muri
R. Niger
Amarr
R. Benue
Lokoja
NIGER
PROTECTORATE
Niger
Aba
Cross R.
CAMEROONS
Akassa
8°30'
9°
10°
10°30'

frequent recurrence of hill and dale pleased and gratified the eye." This remarkable difference of opinion on a question of fact may be partly accounted for by the different appearance of the banks at high and low river. At the time of my journey the river was about 20 feet below the top of its banks, making it impossible to see very far inland. The "ranges of mountains," however, must be at some distance from the river to have so successfully concealed their existence. Long straight reaches are the chief characteristic of the Benue; at several points the river, both up and down stream, disappeared into the horizon without a bend in sight. The bush on both banks was always too thick to make landing possible, except where there was a village; the sandbanks were, therefore, the only available camping-ground.

The canoemen who undertake such long river journeys as this are nearly always Ganegas or riverside Nupes, and wonderful fellows they are. At break of day they roll up their "mimi" mats,* under which they sleep, eat up the remains of their last night's meal, and are ready to start off, and keep going for the whole twelve hours of daylight; this, too, with very little urging on the part of their employer. It seems to be their natural habit, and they eat as they go along, waiting till after sunset for the one big meal of the day. At times, too, where the stream runs strong, very hard work is necessary in order to get by at all; but their back and arm muscles are magnificently developed, and seem to be absolutely untiring.

At Ibi, with the help of the obliging officials of the Niger Company, I supplied myself with carriers and trade goods, and continued my journey for another 70 miles to Amarr by steamer, the scenery being as flat and uninteresting as before.

My party consisted of myself and two black servants, two horses with their attendant horseboys, 40 soldiers, and 36 carriers,† one of whom was also interpreter.

From Amarr, for three days' march the country is flat and in places swampy, though the path itself is generally hard and sound going. I left Amarr on July 18, and on my return, about five weeks later, the country for a long distance was under water, involving some danger of losing the path and getting into a swamp. The safest way was to leave it to the pony, who generally managed to keep on the hard ground.

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* Mimi mats consist of two stiff sides about 6 feet square, which support one another in the form of a shelter

† Divided as follows:—

Soldiers' cooking-pots, etc.	8	loads.
Cloth and barter goods (value £50)	9	„
Three months' provisions for self	10	„
Tent and personal kit	8	„
Surveying-instruments	1	„
	36	„

The Kudu river was 20 yards broad and just fordable on my way up; on the return journey, however, it had increased to 80 yards, and when we attempted to cross on native rafts, one poor man who was swimming got pulled down by a crocodile, so we had to give up the attempt and make a long *détour* by Muri. One or two Berthon boats would have been invaluable on this occasion.

On the third day numerous villages and small towns were passed, each surrounded by an ample stretch of cultivated land. They were none of them walled, the people apparently being unmindful of the possibility of hostile raids. That such are not unknown was evident from the ruins of the old town of Sibi; the town has, however, been rebuilt on a new site, and seems as prosperous and as unprotected as ever. Towra is 90 feet above Amarr,* and from here a succession of hills are seen in front and to the right, with a group of larger peaks away to the north-east.

On the fourth day the scenery changes considerably. The Zanue hills are crossed by a pass 370 feet high, the hills on either side being perhaps double that height. More hills are seen in front and to the right after crossing the pass. The road, however, bears to the left along a flat country to Jebjeb. This town is beautifully situated on a low hill rising out of the plain, with distant hills visible on all sides. It contains about a thousand inhabitants, though there is room within the walls for double that number, and is very much subject to the king of Pali. That monarch was there at the time of my visit with some two hundred followers, who had evidently been enjoying free board and lodging for some time, as they had eaten up nearly all the food in the place. They had reserved, however, a considerable herd of cattle, which, with some ponies and donkeys, they told me were for the king of Bauchi, a still higher suzerain lord, as part of their annual tribute. The king of Bauchi, in his turn, owes allegiance to the Sultan of Sokoto.

My first sight of the king of Pali was most imposing. Having heard of the approach of my party, he came out to meet us. We had stopped the night before at the small village of Jepiroh, beautifully situated on high ground, and chiefly remarkable for the numbers of small green and red parrots that swarmed in the guinea-corn fields all round it. It was the only place where I saw them in any quantities. We started off about 6.30, while the heavy dew was still sparkling on the grass, and soon met the head of the Pali contingent. First came 150 bowmen carrying nothing but their weapons, and wearing only the smallest of loin-cloths. At regular intervals among them were mounted officers. Next came a bodyguard of twenty picked men dressed in red gowns with white pleats down the back, and armed with every imaginable kind of gun, the locks of which were encased in red leather. After passing these men I came on a really beautiful sight. The king

* All the heights on the map are taken above the level of the river-bank at Amarr.

had drawn up under the trees on one side of the path, and some forty or fifty mounted followers had arranged themselves all round and behind him. They were dressed for the most part in white gowns, but generally with either a coloured lining or another coloured gown underneath. Voluminous white or blue turbans covered their heads, and some of them wore very handsome riding-boots, though the majority were barefooted. The high-peaked saddles were covered with brightly coloured saddle-cloths, and the horses' heads were almost hidden by enormous bridles, covered with tin ornaments, which kept up a perpetual jingling as they tossed their heads about to keep off the flies. On my approach, they waved their spears over their heads with the butt to the front in token of friendship. This, with the king in the centre wearing a cap of chain mail under his turban, and bowing with courtierly grace, made a truly mediæval picture.

I travelled for four days in company with these people to the town of Pali. The first three days were all through the orchard-like bush of stunted trees which is the prevailing vegetation throughout this country, and effectually prevents one seeing more than 100 yards in any direction. Occasionally we caught a glimpse of the same distant peaks that I had seen from Towra, and on the first day we passed by the western ends of the Ligeri and Goura ranges. But after that there were no well-marked features, the country being gently undulating. In fact, we seemed to be crossing diagonally one immense undulation, which rose gradually to a height of 1200 feet, and then sloped down again. At varying distances on our left and running parallel with our path was a river, which, however, I never succeeded in seeing on account of the dense bush near its banks. I once saw the tracks of hippopotami near it, so it must be fairly large.

At Sabungali we entered what proved to be a fertile and highly cultivated district. Between here and Pali the path wound among waving crops of guinea-corn and "giro" (millet). These are planted in alternate rows, the giro being harvested in August, but the guinea-corn not till December, by which time it is 16 to 18 feet high—a magnificent sight, with its delicate green leaves and feathery heads of red, white, and yellow grain.

The walls of Pali enclose a considerable area, not all of which, however, is built over, a wide strip just inside the walls being under cultivation. This arrangement for a permanent food-supply within the walls is a precaution in view of the prolonged sieges which are the usual form of war in this country. There are some more solidly built houses here than I saw anywhere else, though no better material than mud is used. The king's compound is half a mile round, and enclosed by a 12-foot wall with only one entrance through it.

Mamaidi is a more compact town, surrounded by a wall and two ditches. It has a fair-sized market-place and one good street. As in

all Fulani towns, each family has its own compound, surrounded by mat walls, and entered through a zowreh, or entrance-porch. There are four or five round houses inside, of the usual type, and all the space in between them is cultivated. Water is drawn up by hand from wells of considerable depth. The country all round Mamaidi is cultivated for at least 3 miles from the town. Here I met Lieuts. Bryan and Macnaghten on their return from Bauchi. To the latter I am indebted for all that part of the map to the north of Pali and Mamaidi. They were very much disappointed with the town of Bauchi, and declared that there was not room within the walls for the 150,000 which Rohlfs reckoned as the population. They put it down as from 15,000 to 20,000. They had the greatest difficulty in getting back across the Kogin Gende river, as there were no canoes to be had, the native method of crossing being to swim across with their loads on their heads, and a large calabash underneath them for extra buoyancy.

We returned to Jebjeb *viâ* Gateri, a town peopled by Jukus, a peaceful tribe whose chief occupation is fishing; for this purpose they spread all down the Benué during the dry season, living in temporary huts on the sandbanks. The town is beautifully situated high up on the southern slope of a hill.

Their neighbours, the Ligeris, are a very warlike pagan tribe, who earn a precarious living by raiding caravans. Our party, however, was too strong to tempt them. A stream just beyond Jebjeb, which I had not noticed on the way up, was sufficiently flooded to cause us a day's delay, and the Kudu river being, as I have said above, impassable, we were compelled to go round by Muri, and strike a creek of the Benué at Uzu. The view from Muri is well described by Bishop Crowther in his 'Journal.'* The appearance of the mountain ranges on the other side of the Benué is particularly striking; they probably stand over 2000 feet above the plain.

Muri is still a thriving town, with its herds of cattle and extensive rice-fields, but its political importance is gone since the Emir migrated across the Benué and founded a new capital at Jalingo. That, at least, is the name of the town as given to us, but it is very likely that it is the same place as Bakundi, for no two black men pronounce the name of their native town alike. We had the greatest difficulty more than once in getting hold of the right names of places.

From the foot of the hill on which Muri is built, the country was under water nearly the whole way to Uzu, and on either side of the road appears to be a mere swamp. The creek or backwater on which the village of Uzu stands is too small for steamers. It took us a whole day punting and one night drifting down it before we reached the main stream; so probably the shortest way into the river is by going up-

* 'Journal,' 1855.

stream. We reached Amarr on September 5, and found various exciting events in progress, but of more military than geographical interest.

On the 8th I arrived once more at Ibi and comparative civilization, having dropped down stream in a native canoe in eighteen hours from Amarr.

I saw no large game of any sort in the course of my journey, but that was only to be expected in the rainy season when the grass is long. Twice, however, we saw elephant tracks across the path; and at Jebjeb I followed up some giraffe tracks for several hours, without, however, seeming to get any nearer to the animal.

Taking observations was also most uncertain work, as the sky was always cloudy. In fact, I only succeeded in taking six reliable observations the whole time. But the beginning of the rainy season is not a bad time for travelling, as the sun's rays are generally tempered by welcome clouds, and also there is enough water in the small streams to save any anxiety on that score.

PROFESSOR DAVIS ON PHYSICAL GEOGRAPHY.

By HUGH ROBERT MILL, D.Sc.

Prof. W. M. Davis, who occupies the Chair of Physical Geography in Harvard University, has published, with the assistance of Mr. W. H. Snyder, a little book to which the title of 'Physical Geography'* is peculiarly applicable. The book is strictly geographical, and purely educational. It avoids the wider scope of physiography, and deals only with facts the relations of which are sufficiently well known to admit of a clear statement of cause and effect. The theories which are dealt with are carried no farther than the supporting facts warrant, and, while the style could not be clearer or the language more precise, there is a complete absence of technical terminology, which might deter the general reader or make the book unattractive for use in schools. The leading principle of the book is thus expressed in the preface:

"The Earth's physical features must not only be described—they must be explained, so that the understanding shall aid the memory in holding them in mind. They must not be presented apart from the manner in which they affect man's ways of living; attention must frequently be drawn to the association of human conditions with the environment by which they have been determined, in order to form the habit of looking at the features of the Earth as prime factors in guiding

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* 'Physical Geography.' By William Morris Davis, Professor of Physical Geography in Harvard University, assisted by William Henry Snyder, Master in Science in Worcester Academy. Boston, U.S.A., and London: Ginn & Co. 1898.

the development of mankind. In brief, physiographic facts should be traced back to their causes and forward to their consequences; and thus the phrase, 'causes and consequences,' comes to serve as a touch-stone by which the treatment of the subject may be tested."

This scientific conception of geography animates the whole book. The introductory chapter very briefly points out that man is very largely a creature of his natural surroundings, and the following chapters are devoted to the study of those surroundings in gradually increasing detail. Chapter II., "The Earth as a Globe," is a very slight sketch of mathematical geography, and is reinforced by several appendices touching on various points in geodesy, the determination of latitude and longitude, and the theory of maps. Chapter III. deals with the Atmosphere, especially in regard to normal climate and weather-changes. Chapter IV. discusses the Oceans. Waves and tides are treated with proportionately great detail and success; the other parts of the subject are not quite so satisfactory. The definition of an "ooze" as a deep-sea deposit of animal origin is a slip for "of organic origin;" but even such trifling errata are exceptionally rare.

Chapter V., "The Lands," is reached on the ninety-first page. It touches on various general points as to the arrangement and structure of land and the distribution of life. The following five chapters are the most original and the best, dealing respectively with Plains and Plateaus, Mountains, Volcanoes, Rivers and Valleys, and the Waste of the Land. Land-forms are dealt with in a comprehensive and yet definite manner, the fundamental classification being by their origin. The many varieties of the coastal plain have never previously been so clearly described or so simply explained, the origin of the form leading directly to the consequences of the form with regard to the distribution of plant, animal, and human life. The same method is carried out for other land-forms, and the descriptions are greatly aided by admirable diagrams in the form of drawings of models combining the superficial appearance and the geological structure of the various features. In dealing with the waste of the land, Prof. Davis calls attention to a matter which has hitherto been unduly neglected in geographical books. Geologists frequently treat of the waste of the land in order to emphasize the different effects produced by weathering on rocks of different composition, texture, and structure. Here we find the geographical aspect of the subject in the study of the phenomena common to the weathering of all rocks:—

"There are many resemblances between the movement of water-streams and of waste-streams. Water flows along stream and river channels more rapidly at the surface, more slowly at the bottom; it is here delayed in lakes, there hurried down rapids. Land-waste may be thought of as moving in streams and sheets down every hillside and along every valley, more rapidly at the surface of the ground, more

slowly at a depth of several feet; more rapidly on steeper slopes, more slowly on plains. The shape of the land-surface and its usefulness as a home for man depend in no small degree on the character of the sheet of waste with which it is clothed."

Chapter XI. is on Climatic Control of Land-forms, a somewhat ambiguously worded title, as the chapter has to be read before one understands that it means the changes produced in land-forms by climate, not the changes produced in climate by land-forms. The effects of floods, of wind, and ice-action are considered under this head.

The twelfth and last chapter is devoted to shore-lines, the elaboration of part of the earlier discussion of coastal plains, and it is very well done, including a discussion of the growth of coral reefs with an absolute minimum of theory.

We know of no other American text-book which draws so freely on other continents for illustrations of striking scenery, although not neglecting the splendid type-specimens of almost every land-form which the surface of the United States supplies. The illustrations are very numerous, most of them new, and all good; but the maps supplied at the end are not sufficient to render an atlas indispensable. Taken altogether, text, illustrations, and maps make up a work of unique value which ought to produce a great effect on the geographical education of the English-speaking peoples.

PROF. PETTERSSON ON METHODS OF OCEANOGRAPHIC RESEARCH.

By H. N. DICKSON.

The number of investigators taking an interest in oceanic physics is slowly but steadily increasing, and every addition to the number makes it more and more desirable that a uniform method of observation should be adopted, in order that the work of each observer should be strictly comparable with that of all the others. In oceanography, as in meteorology, a system of observation has been elaborated such that, while most of the individual methods are susceptible of high refinement in special cases, the ordinary observer need find no difficulty in attaining sufficient accuracy for practical purposes, the all-important matter being to ensure comparability. A certain margin of probable error may sometimes be admitted, which, although not showing a method at its best, means an immense saving of time and labour in dealing with large quantities of material, and makes no appreciable change in the geographical significance of the results.

The system now recommended for general adoption has been elaborated by Prof. Otto Pettersson and his colleagues, and subjected to severe practical testing in the international and other investigations carried on during the last six years in the North sea and North Atlantic. An authoritative explanation of it was published by Pettersson in the *Annalen der Hydrographie* for August last, and the gist of that article is here produced. Those parts of it which have already been

fully explained in English in the series of papers on the same subject in the *Scottish Geographical Magazine* for 1894, or which deal with purely technical details of laboratory manipulation, are condensed or omitted.

It is pointed out that, for a complete knowledge of the circulation of water in any region, observations must not, as has been usual, be restricted to the summer months: the changes taking place in the surface layers of water at different seasons are of the greatest importance in relation to climate and the migration of fishes. For this purpose depths of less than 300 to 450 fathoms (600 to 800 metres) are to be regarded as superficial; beyond that limit seasonal variations cease to be perceptible, and the principal phenomena of currents, etc., are to be found between these depths and the surface.

The method of investigating these superficial layers which has been found most successful, is to have observations made at as nearly as possible the same instant, at a series of points or stations, and along a network of lines distributed over the whole area under investigation. These observations are repeated at as frequent intervals as possible—every three, six, nine, or twelve months—so as to afford data for a series of synoptic charts representing the changes over the whole area. To carry out this plan with any degree of completeness over a large area, such as the Baltic, North Sea, and North Atlantic, it is obvious that some system of international co-operation is essential. Each stage of the work done in the past has led farther and farther seaward, the investigations in the Baltic could not be completed without observations in the North sea, those in the North sea were incomplete without observations in the Atlantic, and so on; but, except during the joint expeditions of 1893 and 1894, which were merely of the nature of a reconnaissance, it has never been possible to get observations on a uniform method over the whole region at the same time. Nevertheless, it is already demonstrated that the beginning of some of the great fishery seasons, such as the times for herring and mackerel fishing, coincides with remarkable changes in the physical and chemical conditions of the surface waters, and in the distribution of plankton. A rational organized regulation of the fishing industries must ultimately be based on a deeper insight into the relations existing between these phenomena, obtained by joint investigation, each country surveying its own fishing-grounds and the seas surrounding them. Isolated expeditions for the study of special biological problems, and, except in a few special cases, observations made at coast stations, can be of little practical value unless combined with a general survey of the nature described.

The observations required fall under three headings—

(*a*) Deep-sea observations.

(*b*) Temperature observations and collection of samples of surface water and plankton by steamers crossing the North sea and North Atlantic.

(*c*) Observations in coastal waters.

Experience has shown that observations of classes (*b*) and (*c*) can be obtained without much trouble or expense; ship-masters are, in fact, always anxious to give assistance when a scheme likely to lead to results of practical value is put before them. The expensive information is that of the (*a*) class, and it is therefore desirable to reduce the number of expeditions and stations to a minimum. Certain positions have already been recognized as of special significance in affording a general view of the area within which they are situated, and it is likely that, with the growth of knowledge, the number required to determine the conditions at a given time would become comparatively small.

Great economy of time and money may be effected by restricting the work at sea on such expeditions absolutely to the collection and preservation of material.

This has been constantly kept in view during recent years, and the chemical and biological examination of the samples obtained is now wholly carried out in laboratories on shore after the sea-work is finished. It is thus possible to do the work at sea efficiently with a much smaller staff, and without specially fitted laboratories and apparatus on board each vessel; and the chemical work, at least, gains immensely in accuracy. It is only on long expeditions that a special laboratory on board is necessary, and then only for work in harbour.

It is not to be expected, nor is it desirable, that the workers on all deep-sea expeditions should employ absolutely the same instruments in precisely the same way. There is, indeed, no standard set of instruments obviously to be recommended in preference to any other; but a few general principles may be laid down as the result of the joint experience of observers.

A water-bottle with non-conducting water-jackets should be used for all moderate depths. This instrument should be made so as to have the least possible heat capacity, the metal employed should be a good conductor, and it should have perfectly free circulation of water through all its parts when open: under these conditions it takes the exact temperature of the surrounding water very quickly while descending. The water-bottle must close perfectly tight, so as to retain the sample of water in the central tube unchanged, and prevent large temperature-variations in the outer non-conducting jackets. When these conditions are fulfilled —as they are in the special form of instrument devised by Prof. Pettersson—the sample is much better isolated than in any water-bottle with a non-conducting jacket of gutta-percha or similar material, and a more accurate and reliable temperature observation can be made after the instrument is got on board than is possible with reversing thermometers taking the temperature *in situ*. The chief disadvantage, as compared with the reversing thermometer, is, of course, the difficulty of taking a series of temperatures at different depths with a single sounding, but this becomes important only when the depths are considerable, and it is then safer to have the reversing thermometer for comparison in any case.

In collecting samples for gas analysis, it is important to use the non-conducting water-bottle, whatever the depth, as the dissolved-gas contents of the sample may be considerably affected if exposed to large changes of temperature.

For all deep-sea purposes, it is best to use a flexible wire sounding-line of steel or phosphor-bronze. Prof. Pettersson prefers a rope of 49 phosphor-bronze wires 0·3 mm. in diameter, obtained from the Fonderie Anderlech, in Brussels. Great purity of material is important here, as a very small quantity of foreign metal (*e.g.* bismuth) seriously reduces the breaking strain of the rope. In working at great depths, it is best to have a line consisting of several parts of different thicknesses, so that the breaking strain increases proportionally with the weight of line. The hauling up can be done by steam; the speed of winding may average about 40 fathoms per minute, but should never exceed 55 fathoms per minute.

The ideal metal for deep-sea instruments is German silver; nickelled surfaces are to be avoided. Brass is a quite satisfactory material, and has the merit of cheapness, but the instruments must always be washed in fresh water and dried and polished after use. Galvanized iron may be used for rough instruments without sliding parts.

The first essential in studying the features of the circulation of water in any region is to ascertain the sources whence the water-supply has been derived; thus in all latitudes in the Atlantic, waters from north and south are to be found close together, arranged in layers or in various stages of mixture, and the different elements can only be identified by minute physical, chemical, and biological examination, the important factors being temperature, salinity, gas contents, and

the general character of the animal and vegetable plankton. In the case in question, one has to deal with "Gulf Stream" water, Arctic and West Atlantic water, and all attempts to identify these separately by variations in relative proportions of the dissolved salts having proved vain, the general distribution of the elements just named is the only available means of investigation. The first place in importance must be given to the distribution of salinity, and it is absolutely necessary to employ a physical or chemical method by which this can be determined with a high degree of accuracy, in large numbers of samples, with a reasonable expenditure of time and labour. There can now be little doubt that by far the most satisfactory method in every respect is that first employed and advocated by the Swedish investigators, and now generally adopted by almost every one who has to deal with large quantities of material—the determination of the total halogen by estimation as salt of silver, either gravimetrically, or volumetrically by titration with a one-fifth normal solution of silver nitrate. The method of titration admits of sufficient accuracy to allow of the determination of salinity to within 0·1 *pro mille*, using only 10 cubic centimetres of each sample. Prof. Pettersson gives very full details as to the mode of working, precautions to be observed, etc., which are indispensable to the practical analyst, but are too long and too severely chemical to be given here.

Another method of ascertaining salinity is to determine the specific gravity of the water at a standard temperature with a Sprengel pyknometer. Hydrometers of all sorts are to be avoided, on account of the great difficulty of getting and maintaining the uniform standard temperature in the whole mass of the water, the hydrometer, and all its surroundings. Unless this condition is fulfilled, hydrometer determinations, though apparently very consistent amongst themselves, may be exceedingly inaccurate.*

Where analytical work is done on an extended scale, it is desirable to have a set of standard samples of sea-water of which the specific gravity, chlorines, sulphates, and "total solids" have been carefully determined, to be used as "controls" in making up fresh solutions of reagents, etc.

The alkalinity of sea-water offers a considerable field for investigation, since it is now known that the alkalinity of samples stored in glass bottles alters considerably, and most of the determinations made up to the present have been affected with error on this account. Titrimetric determinations of the alkalinity of sea-waters collected in *earthenware* bottles are probably free from objection, and an extended series of such observations is likely to be of great value.

The real significance of determinations of the quantities of gases dissolved or absorbed in sea-water has only been fully recognized in quite recent years, and the extreme interest and importance of this branch of oceanographic research demand the translation of Prof. Pettersson's remarks upon it at length. The amount of dissolved nitrogen in a deep-water sample enables us, by calculating the "saturation temperature" by the graphic method of Hamburg, to ascertain the temperature which the water possessed on the last occasion when it was at the surface, and so, in many cases, to discover *where* it was last at the surface. The amounts of dissolved oxygen and carbonic acid throw much light on the biological conditions. In 1890, Pettersson and Ekman found that the water in an isolated part of a Swedish fjord contained a great excess of carbonic acid and a corresponding deficiency of oxygen, and subsequent experiments in an aquarium confirmed their supposition that these

* The writer has found that, using ordinary precautions only, salinity determinations by chlorine titration and the pyknometer agree, in general, to within less than 0·2 *pro mille*, and in cases where larger error has occurred, the fault has been found to be almost invariably on the side of the pyknometer.—H.N.D.

abnormalities were due to the respiration of marine animals. Later observations showed that similar peculiarities occurred in intermediate water-layers not completely cut off from the open sea as in the first case. Thus, in the Gullmar fjord, where in the winter 1895–96 successful herring fishery was carried on, it was found that in a layer between 20 and 30 fathoms below the surface the amount of carbonic acid was 48·5 to 49·6 cubic centimetres per litre, and of oxygen only 5·6 to 3·9 cubic centimetres, as compared with 47·4 and 7·1 cubic centimetres respectively outside the mouth of the fjord, the temperatures being identical. Employing deep-water nets, it was found that during the day the herring could be caught only in the 20 to 30 fathom layer inside the fjord; at night they came to the surface waters (containing 7·1 cubic centimetres of oxygen per litre), and could be taken with ordinary nets.

Prof. Pettersson fairly concludes from this that the deficiency of oxygen in the bottom waters in certain parts of the North sea, observed by the expeditions of the *Pommerania* and *Drache*, and by himself in the Skagerak and Baltic, may be regarded as a result of the presence of animal life. The deeper waters of the North sea and the Baltic are in general poor in oxygen—a fact which corresponds well with the great richness of the North sea fisheries.

An exactly opposite effect has been observed in oceanic water where the influence of plant-life is predominant; the algæ, diatoms, cilioflagellates, etc., reduce the percentage of carbonic acid and increase that of oxygen. A number of samples of deep water obtained by the *Challenger* and Norwegian North Atlantic Expeditions, mostly from high latitudes, were found to be supersaturated with oxygen. Pettersson found similar conditions in the Baltic east of Gothland, where Hensen has shown that the surface waters are very rich in diatoms; and again in the Skagerak, in water which from its temperature and salinity had been supposed to come from the Western Atlantic. Dr. M. Knudsen, chemist of the Danish *Ingolf* Expedition, has found that excess of dissolved oxygen, due to the action of plant-life, may be present even at the surface, and Pettersson has recently shown that this occurs in the surface waters of the Skagerak.

Samples of sea-water for gas analysis must be preserved in exhausted tubes, which are filled direct from the water-bottle as soon as it comes on board, and sealed off. In view of the action of organisms just described, it is advisable to coat the inside of these tubes with a thin layer of perchloride of mercury before drying and exhausting them, by washing them out with a dilute solution. Two tubes of each sample are required, as it is impossible to make the carbonic acid and oxygen determinations from the same tube. The volume of the tubes should be about 150 cubic centimetres.

The description and quantitative estimation of the organisms in sea-water have been brought prominently forward in oceanographic research during recent years. The qualitative or descriptive side has been largely developed by the Swedish biologists Cleve and Aurivillius, who have classified the forms constituting the plankton in different regions into types, investigated the geographical distribution of these types, and found that a close relation exists between the physical and chemical conditions of surface water and the plankton, especially the phytoplankton, which it contains. The different physico-chemical regions into which the North Atlantic has been divided, for example, have each characteristic plankton types, and the appearance of these types in different parts of the North sea and Skagerak at different seasons of the year coincides with the influx of waters from those regions. The most recent result is that at certain seasons large areas of the North Atlantic are practically devoid of plankton, while an aggregation, or special abundance, occurs in other parts at the same time. Our knowledge of this subject is as yet only in its infancy, but the advantages to be derived from extended

co-operative research are already obvious. The Swedish Hydrographic Commission has arranged for a series of plankton observations being made on board a number of Trans-Atlantic and North sea steamers, and regular collections are being made at the Bermudas, Azores, Færoes, and Shetlands, and in Iceland. The director of the Danish Hydrographic Office has arranged for daily observations on the steamers plying to Iceland and Greenland, and regular work is being done at the stations on the Norwegian coast, at the marine biological stations at Plymouth, St. Vaast la Hougue, and Helder. This preliminary survey will suggest the lines to be followed in organizing a more complete investigation.

The plankton of intermediate and deep layers can be examined by using a horizontal tow-net which can be opened and closed. The form used by Prof. Pettersson is fully described in the *Scottish Geographical Magazine* for 1894, p. 299.

Quantitative estimations of the plankton, such as those made extensively by Hensen, and of the numbers of pelagic eggs and fish-larvæ, like those of the German Commission, the Fishery Board for Scotland, and the Danish biological stations, are of course of the greatest importance in the discussion of fishery questions, and there is the further need of more extended knowledge of the life-history and development of the organisms whose distribution is examined. Problems of the last-named order must be investigated by the marine biological stations now dotted round the coasts of the North sea and the Baltic. Prof. Pettersson points out, however, that most of the existing stations are situated at points remote from deep water, so that they offer no opportunity of studying deep-living organisms in their natural habitat, and our knowledge of the conditions of pressure, salinity, and temperature in the depths is as yet insufficient to enable us to reproduce these conditions in aquaria, at least in a manner quite satisfactory to the organisms. Prof. Pettersson has suggested to the Royal Academy of Agriculture at Stockholm the desirability of establishing a station at a point off the western coast of Sweden, where a depth of 30 fathoms can be obtained close in shore; water from the depth could be pumped directly into the tanks, or cages containing specimens under investigation could be anchored at any desired level. It is increasingly evident that the hydrographic conditions have been far too little considered in the past in this connection, and it must be remembered that a situation exposed to winds and waves does not necessarily offer truly marine conditions.

Reference is made to the method of studying the circulation of surface waters by means of floats or drift-bottles, which has been largely employed by the Prince of Monaco, the Deutsche Seewarte, Dr. Fulton of the Scottish Fishery Board, Mr. W. Garstang, and others, and has shown that in careful hands it may yield results of considerable value. Dr. Schott has recently proved that the construction of the float used has wonderfully little effect on the course it takes, and it follows that the simplest form is the best; the Swedish investigators use a glass bottle of about 100 cubic centimetres capacity, loaded with sand, and containing a stamped post-card with suitable legend.

THE NATIONAL ANTARCTIC EXPEDITION.

Deputation to the Government.

On June 22 a large and influential deputation waited upon the Right Hon. A. J. Balfour, First Lord of the Treasury, with a view to urge the claims of the National Antarctic Expedition upon Government

support. Among those forming the deputation were the following: The Duke of Northumberland, the Earl of Rosse, Lord Kelvin, Sir George Gabriel Stokes, Sir Clements R. Markham, Sir Joseph Hooker, Admiral Sir Leopold McClintock, Admiral Sir Erasmus Ommaney, Admiral Sir Vesey Hamilton, Admiral Sir Anthony Hoskins, Admiral Markham, Sir Michael Foster, Prof. Rücker, Sir Henry Norman, Sir John Kirk, Sir Charles Wilson, Sir William Crookes, Sir George Goldie, Sir William White, Sir Clement Hill, Sir John Evans, Colonel Sir T. H. Holdich, Sir George Robertson, Prof. Storey Maskelyne, Dr. F. Du Cane Godman, Prof. Judd, Prof. G. Darwin, Sir Martin Conway, Mr. A. B. Kempe, Prof. Frankland, Dr. T. W. Blanford, Dr. Alexander Buchan, Prof. Ewing, Dr. Günther, Colonel Le Messurier, Dr. P. L. Sclater, Prof. T. G. Bonney, Prof. Oliver Lodge, Prof. E. Ray Lankester, Mr. F. C. Selous, Mr. W. Whitaker, Captain A. Mostyn Field, R.N., Mr. E. L. S. Cocks, Mr. J. F. Hughes, Mr. Howard Saunders, Colonel Church.

The deputation was received in response to the following influentially signed letter to Lord Salisbury and the Hon. Arthur J. Balfour:—

"*To* Her Majesty's Prime Minister and the First Lord of Her Majesty's Treasury.

My Lords,—When an appeal was made to the Prime Minister in 1897, with the object of obtaining the despatch of a Scientific Antarctic Expedition, the ground of refusal was that, under existing circumstances, and in view of Australia's reluctance to co-operate at that time, Her Majesty's Government could not embark upon an undertaking of such magnitude.

We now make an urgent appeal to Her Majesty's Government to propose to the House of Commons a grant in aid, to enable an expedition on a modest scale to be despatched with the object of securing some of the results of antarctic exploration.

The great importance of despatching an expedition, from the point of view of the progress of science, induced us to appeal to the country for funds, and our appeal has met with a most generous and patriotic response. We now, therefore, approach Her Majesty's Government with a definite scheme, and, in place of help hitherto refused by the Australian Governments, we offer a sum of £40,000 already subscribed in this country, which is sufficient to pay a considerable portion of the cost of an expedition. We only ask that this sum may be adequately increased by a Government grant.

This is the first time that the Royal Society and the Royal Geographical Society, aided by other scientific bodies, have combined to organize and despatch an expedition. Such an undertaking is outside their ordinary duties, and they entered upon it with a serious sense of the responsibilities it will entail, but with a strong feeling that, under the circumstances, no other alternative was left to them. This, therefore, is in no sense a private enterprise, while its objects are precisely identical with those of the many polar expeditions despatched or subsidized by the Government, as shown in the annexed list. Its national and representative character is emphasized by His Royal Highness the Prince of Wales having consented to be Patron, and His Royal Highness the Duke of York to be Vice-Patron, of the expedition.

An appeal which has been received from the scientific bodies of Germany to

co-operate with a German expedition (for the equipment of which the Reichstag has been asked to vote £50,000, supplementing a large public subscription), renders it still more incumbent upon us to commence our preparations without delay. There can be no doubt that, considering the modest scale of both expeditions, such co-operation would be most desirable. In more than one branch of scientific investigation simultaneous observations at distant points near the same parallels, if not essential, will largely increase the value of the results. It is obvious that in many ways the co-operation of the English and German ships will have a tendency to reduce the cost.

On the grounds of policy alone, we submit that this is not a time for our country, so long the mother of discovery and of maritime enterprise, to abdicate her leading position. From the results of our exploring expeditions in times past, not only the naval service and the country, but the whole civilized world have derived benefit. It is certainly the desire of the people of this country that her glorious traditions should be maintained.

The expedition will probably last from two to three years, and among its principal objects will be geographical exploration of the unknown region, the taking magnetic, meteorological, and biological observations, and deep-sea sounding and dredging.

We do not, however, propose to enter upon a detailed statement of the scientific results in this letter, since we enclose, for the information of your Lordships, a memorandum containing an explanation of the objects of the expedition. But we may observe that the most important work, and the work which will be of the greatest practical utility, is that connected with terrestrial magnetism, and that the requirements of magnetic observations necessitate the building of a specially constructed vessel.

The cost of an Antarctic Expedition cannot be exactly estimated until tenders have been received for building the ship based on drawings and specifications, nor until it is known how long the expedition can be employed. This must depend on the funds. But allowing for three years, the estimate for an expedition such as it would be desirable to equip, would amount approximately to £100,000.

	£
Building a suitable vessel	35,000
Fittings, etc.	4,000
Salaries and wages, three years	20,000
Provisions	8,000
Clothing, outfits	7,000
Coals and stores	10,000
Landing party	6,000
Contingencies	10,000
	£100,000

The Lords Commissioners of the Admiralty have undertaken to furnish the scientific instruments.

We thus submit, for the consideration of Her Majesty's Government, our scheme and our estimate, and we enclose a statement of the valuable results which we hope to secure. It is a national enterprise, supported on good grounds by all the scientific bodies of the Empire, and we request the Government to supplement our fund of £40,000 by proposing a Parliamentary grant sufficient to complete the estimate for the equipment of a properly found Antarctic Expedition. The payments under such a grant might be spread over four or even five years. There can be no doubt,

judging from former precedents, of the reception which such a proposal will receive from a British Parliament.

We request your Lordships to receive a deputation of our number to furnish any further information which may be considered desirable.

(Signed)

LISTER, *President of the Royal Society*; CLEMENTS R. MARKHAM, *President of the Royal Geographical Society*: WILLIAM CROOKES, *President of the British Association*; KELVIN, *President of the Royal Society of Edinburgh*; ARGYLL, *Past President of the Royal Society of Edinburgh*; LOTHIAN, *President of the Royal Scottish Geographical Society*; JOHN LUBBOCK, *Past President of the British Association*; JOSEPH D. HOOKER, *Past President of the Royal Society*; JOHN EVANS, *Past President of the British Association*; JOHN MURRAY, *Director of the "Challenger" Expedition Publications*; RICHARD STRACHEY, *Chairman of the Meteorological Council*; W. H. M. CHRISTIE, *Astronomer Royal*; ARCHIBALD GEIKIE, *Director-General of the Geological Survey of the United Kingdom*; G. H. DARWIN, *President of the Royal Astronomical Society*; WILLIAM H. FLOWER, *President of the Zoological Society*; A. GUNTHER, *President of the Linnean Society*; W. WHITAKER, *President of the Geological Society*; T. E. THORPE, *President of the Chemical Society*; OLIVER J. LODGE, *President of the Physical Society*; JOSEPH LARMOR, *President of the Cambridge Philosophical Society*; HORACE LAMB, *President of the Manchester Literary and Philosophical Society*; THOMAS FOWLER, *Vice-Chancellor of the University of Oxford*; ALEX. HILL, *Vice-Chancellor of the University of Cambridge*; HENRY E. ROSCOE, *Vice-Chancellor of the University of London*; N. BODINGTON, *Vice-Chancellor of the Victoria University*; A. B. KEMPE, *Treasurer of the Royal Society*; MICHAEL FOSTER, *Secretary of the Royal Society*; ARTHUR W. RUCKER, *Secretary of the Royal Society*; W. T. BLANFORD, *Treasurer of the Geological Society*; P. L. SCLATER, *Secretary of the Zoological Society*; ALEXANDER BUCHAN, *Secretary of the Scottish Meteorological Society*; L. DARWIN, *Secretary of the Royal Geographical Society*; J. F. HUGHES, *Secretary of the Royal Geographical Society*; EDWARD L. S. COCKS, *Treasurer of the Royal Geographical Society*; W. A. HERDMAN, *Professor of Natural History in the University College, Liverpool*; F. LEOPOLD MCCLINTOCK, *Admiral*; ERASMUS OMMANNEY, *Admiral*; ANTHONY H. HOSKINS, *Admiral*; R. VESEY HAMILTON, *Admiral*; G. S. NARES, *Vice-Admiral*; A. H. MARKHAM, *Vice-Admiral*; A. MOSTYN FIELD, *Captain R.N.*"

The deputation was introduced by Sir Clements Markham, K.C.B., President of the Royal Geographical Society, who spoke as follows:—

The deputation consists of two past Presidents of the Royal Society, of all the signers of the letter to the Marquis of Salisbury and yourself who have been able to come, of members of the Council of the Royal and Royal Geographical Societies, of numerous other scientific men of eminence, and of several naval officers, including five admirals of arctic experience.

It will perhaps be most convenient if I begin the interview by stating our grounds for asking for a grant to the Antarctic Expedition in general terms. It is now fifty-six years since the return of Sir James Ross from his memorable antarctic voyage. During that time the methods and appliances for scientific investigation have been

greatly improved, especially as regards apparatus for deep-sea sounding and dredging. At the same time actual exploration, difficult and perilous though it must always be, has been facilitated at least twenty-fold by the introduction of steam. It was these considerations which caused a feeling to grow up among scientific men that there ought to be a renewal of antarctic research, in order to secure the very important scientific results which it was known must accrue from such a renewal. This feeling was not confined to societies in this country but was shared by men of science throughout the civilized world. When, therefore, it was found that Her Majesty's Government would be unable to undertake an enterprise of such magnitude as would be involved in a naval expedition, and when it was ascertained that the Australasian Governments would give no help, the Royal Society and the Royal Geographical Society resolved to undertake a smaller enterprise themselves. They did this with the cordial approval of all the other scientific bodies of the empire. They felt that it was a duty, and that they were left no choice; and they expected to receive assistance from Her Majesty's Government, provided that their appeal to the country for funds was favourably received. Their application for help, now that the country has entrusted them with a sum of £40,000, is based on the following grounds.

For the last century and more the successive governments of this country have sent forth numerous polar expeditions both to the north and south, with the objects of geographical discovery and the advancement of other branches of science—in short, for the increase of the sum of human knowledge. For a century our rulers have believed that expeditions with such objects were beneficial to the country. I do not say that these were the sole objects of such statesmen as Lord Liverpool, Lord Melbourne, Sir Robert Peel, or Lord Beaconsfield, who sent the expeditions; or of the Lords of the Admiralty who were foremost in advocating polar research—men like Sir Henry Hotham, Sir George Cockburn, and Admiral Bowles, and in our own day as Sir Vesey Hamilton, Sir Anthony Hoskins, and Sir Edmund Commerell, who has spoken most strongly on the subject. They looked to the encouragement of maritime enterprise, they looked upon the polar regions as a splendid school for the exercise of the best qualities of a seaman, and considered the value of such expeditions to the navy in time of peace.

Still, the avowed object of Government expeditions was scientific research. Our objects are identical. We are undertaking work which successive generations of our statesmen and naval officers have looked upon as beneficial to the country and to the navy, and for this reason we think that we have a claim for the favourable consideration of our request for help from Her Majesty's Government.

But that is not the only ground for our expectation. Some of the scientific results which we seek to obtain are of immediate practical value. Indeed, all scientific research becomes eventually, directly or indirectly, sooner or later, practically useful. Much of the antarctic work will, however, at once be of use to navigation. This is especially the case as regards the magnetic survey, as will be more fully explained by Prof. Rücker. Meteorology is another branch of antarctic research which will be practically useful. The unknown region covers millions of square miles, but it touches or impinges upon oceanic regions to the north which are frequented by our shipping. As regards winds and currents such adjacent regions act and react upon each other, so that the removal of total ignorance, as regards one of them, must be practically useful to the navigation of the others. A knowledge of meteorology necessitates geographical discovery, because its phenomena are influenced by the distribution of land and water. Geography depends upon geology and biology, and thus one science cannot be benefited without advancing the others.

We believe that this practical utility of the scientific researches to be undertaken

in the antarctic regions is another claim for the favourable consideration of our application for help.

There have formerly been some private expeditions to the polar regions; but, when application has been made, naval officers have always been allowed to join them, and help has invariably been given, on three occasions in the form of Treasury grants. A refusal of help would be absolutely unprecedented.

But this is the first occasion in the history of our country that the Royal Society and the Royal Geographical Society have combined to equip and despatch an expedition. It is no part of their ordinary duties. It is a great responsibility, and we shall have many difficulties which would be unknown to the Admiralty—a department accustomed to the equipment of polar expeditions for the last century.

We have been invited to co-operate with the German expedition, and we cannot hold back. England has held the front rank in maritime discovery for three centuries, and her place must be maintained by her sons. We have striven to collect the necessary funds. Our fellow-countrymen have been most generous. But the sympathizer who has contributed most liberally has done so mainly to enable his country to maintain her old and glorious place in the van of discovery. The German expedition is to receive a grant of £60,000 from the German parliament. I do not mention this, sir, as a precedent—we have plenty of good precedents of our own, without the need of going abroad for them; but I mention it to show that the German vessel will be efficiently equipped.

We are bound, in the cause of science and for the honour of our country, to co-operate with the German expedition. We can do so in a small way. We can and must send an expedition of some kind. We earnestly ask Her Majesty's Government to enable us to send a really efficient expedition.

Sir Joseph Hooker, who was President of the Royal Society, and who is, I may add, the last survivor of Sir James Ross's memorable Antarctic Expedition, will now address you on the same subject.

Sir Joseph Hooker: Mr. Balfour, I am prepared to echo every word which has passed the lips of Sir Clements Markham. The proposed Antarctic Expedition is strictly a scientific one, with a very practical point included, which Prof. Rücker will explain in due fulness. It is to aid in the exploration of a large circumpolar area of the globe, comprising no less than thirty degrees of latitude, of which we know only the outskirts very imperfectly, and nothing of the interior. That land and sea we know are covered with ice, and it has been held and urged, not unnaturally, that any attempt to penetrate into and explore a country which is utterly uninhabitable by man and animal is both futile and useless. That is not the opinion of those in search of knowledge. The very fact of that region being covered with ice shows that by its marine currents, and by its atmospheric currents, it is modifying the atmosphere of the whole southern hemisphere, and in conjunction with the action of a similar area, but a smaller one, in the north, it may be said to modify the atmosphere of the whole globe. Now, what is the object of our expedition? One great object is to find out what are the meteorological conditions of the vast area which produces such complex and such important results. This can only be done by a scientific expedition well fitted with proper instruments, and capable of using them. When that is done, we shall know more of the physical history of the southern regions than ever we knew before. The practical point to which I alluded is that of magnetism. We know that the deviation of the compass, which is so important to mariners, depends upon the position of the north and south magnetic poles, and that the south magnetic pole had its position ascertained approximately by Sir James Ross fifty or sixty years ago, and since

then we know that this position has moved, and it is most important that that which it now holds should be determined. But on this, Prof. Rücker, I am sure, will address you. Turning from the meteorology to the geology, we have this enormous area, of the geological history of which we know absolutely nothing. We do not know how far it can compare with the three great continents to the northward of it. We know that quite lately a few specimens of fossil plants and of fossil animals have been picked up, which assure us that there was a geological time when it was more or less covered with what are not there now—terrestrial animals and terrestrial plants. Certainly that point is a scientific and a most important one, and I think that this alone would justify the despatch of an expedition. With regard to the zoology of that region, Dr. Lankester is prepared to speak. With regard to the botany I have very little to say, but that is of very great importance. We know there is no terrestrial vegetation there except vestiges, no doubt wafted from the nearest continents; but the ocean teems with vegetable life, and that vegetable life is the foundation of all life in that ocean. The sea teems with myriads of microscopic diatomaceæ, whose silicious skeletons are forming future geological strata—great beds of stone. These minute animals are composed of an enormous number of genera and species which have yet to be investigated. They live in the ocean at all depths, apparently, and they occupy a most prominent place in the life of those regions. They are the food of the lowest animal organisms there, which again are the food of the higher. With regard to other objects of the expedition, I think they will be dwelt upon by persons here better fitted to do so than I am. There is only one point I would add, and that is that no time should be lost in sending out such an expedition. Other nations have sent out expeditions with which we should be in friendly rivalry—in co-operation; thus affording the hope that we shall thus secure comparative results, made at the same time in different portions of the south polar area.

Lord KELVIN: The primary object of antarctic exploration in the present day is to explore the southern boundary, the antarctic boundary of navigable waters. Germany, Belgium, and England have joined in this object. Surely, as Britannia rules the waves, it is of primary importance for England to take part in the exploration of her own realm. It is an object of the highest practical importance, in respect to navigation in southern waters, to know the real boundary of navigable seas. It is marvellous how little is yet known, because sailing vessels and steamers alike avoid going too far south for fear of being caught in the ice; but they do not know how far they may go, and it seems highly probable indeed that improved routes for navigation will be found by antarctic exploration of the cold southern boundary of the navigable waters. The sciences concerned, geographical, hydrographical, meteorological, magnetic, and the sciences of biology and geology, are all full of the most profound interest. We know that the primary object is, as I have said, the exploration of the southern boundary of navigable waters—that is the primary object only in point of space and time and action. The next thing is to know what lies beyond the boundary of the navigable waters. Pack-ice in many places—great masses of ice—we do not know how much there may be. A good deal we learned from the *Challenger* Expedition, but we learned chiefly how much more there is to discover than anything the *Challenger* was able to find. Landing on the antarctic continent is a highly important object, perhaps not the most important of all, but one of the most important of all the objects. We do not know whether there is an antarctic continent or not. All we know about it is that which Sir James Ross taught us. In the expedition from 1839 to 1843 of the *Erebus* and *Terror*, with which Sir Joseph Hooker, who is now with us, was

present, Sir James Ross tried Cape Adare, lat. 72° S., just about due south of New Zealand, which is in long. 170° E. Sir James Ross at Cape Adare tried to land, but was prevented by 8 miles of pack-ice. He did not land and plant the British flag there, but he gave it the name of Victoria Land, and he sailed 6° S. to lat. 78°, past 360 miles of coast, and then turned eastward and coasted 400 miles. Thus we have 760 miles of Victoria Land explored from the sea. Many promising places for landing were indicated by Sir James Ross's sea exploration, and one of the objects of the present expedition is to land somewhere there—to try several different places—and to go inland to the south magnetic pole. That may be comparatively easy. To go to the true south antarctic pole may be a much easier thing than to go to the north pole, or may be much less easy; we do not know, but it is very unsatisfactory that we should not know the whole contents of the antarctic boundary of the line of navigable waters. Sir George Newnes's expedition has made a very excellent beginning in that direction. Sir George Newnes's expedition found Cape Adare clear of ice—more favourable circumstances than met Sir James Ross. They landed last February, and last February the commander of Sir George Newnes's expedition, Mr. Borchgrevinck, a Norwegian, actually landed at Cape Adare, the first landing on the southern continent, if it is a continent. He landed there and remained with the party to winter and explore, and he is there now exploring. I think really we should feel that, when so much has been done, it is an object of paramount practical and scientific and national importance that aid should be given to the expedition, and that whatever is necessary for making the expedition thoroughly effective should be found. I do hope and trust that the British Treasury will see that it is a proper expenditure of money to give thoroughly effective assistance to this work.

Prof. RAY LANKESTER: Mr. Balfour, I am asked to say a few words as to the results which may be expected in the direction of biological science, from such an expedition as that which is proposed in the antarctic regions. The main biological interest appears to me to depend upon the fact that we have at the two poles a body of sea-water under very similar conditions, that is to say, in contact with ice, therefore cooled to a very low degree, and presenting physical conditions which are identical; at the same time separated by tropical oceans, and therefore practically apparently cut off from one another. Now, so far as the exploration of the living contents of the antarctic ocean has gone, it appears that they are extremely numerous, extremely abundant, and yet have a most curious resemblance to those of the arctic region. This is not merely a parallelism of forms which are alike and similar to one another, but extends to actual identity. There are eleven species of fish which are found in the antarctic sea, and which are identical with species found in the arctic sea. Amongst these is a well-known fish called the king of the herrings (*Chimæra monstrosa*), and also the conger eel, the common dog-fish, and the sprat. Now, it is a matter of great interest to ascertain, or rather to get further grounds for forming an opinion, as to how this identity of fauna has come about between the living fauna of regions so far apart and separated by such totally different conditions as those which obtain in the regions themselves—I allude to the difference between the two polar seas and the tropical seas. Various speculations have been put forward to account for this. One is that certain deep cold currents traverse the warmer waters of the ocean and form hidden roadways, as it were, by which the arctic and antarctic faunas may communicate. Then, also, the opinion has been held that formerly there was a uniform fauna which was identical throughout the seas of the globe, and is now surviving at these two polar regions, having been superseded in the middle region and warmer regions of the ocean by the newly developed forms. That is a kind of problem which a further

exploration of the antarctic ocean would help us to solve. We have had very little real investigation of the antarctic region, certainly hardly any, by the improved methods of dredging and sounding, and of collecting living things, since Sir Joseph Hooker was there more than fifty years ago. The *Challenger* Expedition looked into this antarctic region, so to speak, but did not go very far, and was not able to remain very long, and there is no doubt that we only know the merest sampling of what exists in the antarctic sea. There is every reason to hope that an expedition which would be there for some time, well equipped with the present means of investigation, and of procuring living things, would bring home most interesting and important additions to our knowledge. Those, besides what may be expected from the fossil forms found in the rocks of that region, are the main points of biological interest in this Antarctic Expedition. No doubt we should obtain by such an expedition a great addition to our national museum of natural history, and the materials so produced would help to solve the problem which I have mentioned.

Prof. Rücker: I should like, in the first place, to say, Mr. Balfour, that this is a question upon which all magneticians are practically at one. I had the honour last year of being the President of an International Conference on Terrestrial Magnetism, which was held at Bristol, and I then had a very special opportunity of conversing with many of the best-known magneticians from the different European countries and from the United States. I think I may say that we were all agreed that the great outstanding want in our magnetic knowledge at present would be to a large extent met by a further exploration of the antarctic region. As you are aware, several countries are taking steps in this direction. As one of the representatives of the Royal Society—of whom two others are here, Sir M. Foster and Prof. Armstrong—I was present a year ago at a meeting of the great German academies at Göttingen. There the question of antarctic exploration was discussed, and I think my two colleagues will agree with me that the very greatest stress was laid upon English co-operation. It is not, indeed, contended that the two expeditions should go side by side, but that they should attack the southern pole from different points; and it is thought that by two simultaneous attacks, much better results can be obtained than if they were made at an interval of several years. Then, in the next place, with regard to the magnetic problem itself, without entering into any technical details, I may perhaps say, though no doubt you are aware of the fact, that the magnet, though it points approximately to the north, is continually altering in its position, pointing sometimes more to the east and sometimes to the west. If we are to get a knowledge of the magnetic state of the Earth which may enable us in the future to foretell magnetic phenomena, it must be by getting a series of pictures of the magnetic state of the Earth at regular intervals, and comparing the one with the other. The great want in the picture which we have at present is a knowledge of the magnetic state of the Earth around the south pole. The annual change in the direction in which the magnet points can be approximately determined at any place if you know it in the neighbourhood. But it so happens that at all the great land projections into the Southern ocean—Cape Horn, the Cape of Good Hope, and the Australian continent—the position of the magnet happens to be changing very little indeed at the present time, whereas we have sufficient evidence that very great changes are going on in the intermediate regions. We have been unable to study these changes, because the particular points at which we can with the greatest facility observe are points at which very little change is taking place. It is therefore necessary that observations should be made at sea, and one of the great difficulties which arise on this point is that, although, as has already been said, steam-navigation has enormously

increased our power of penetrating unknown regions, on the other hand, the introduction of iron ships has immensely diminished our power of taking satisfactory magnetic observations. In the old days observations could be made, roughly perhaps, but still with sufficient accuracy on a wooden ship; nowadays all the ships which go near the region we are discussing are of iron. It is, therefore, quite essential that there should be a special expedition, in which a ship specially constructed for the purpose of magnetic observation should be used; and by that means alone can we hope to get the results that are wanted. Further, I may add that the only observation which is generally made upon a ship is as to how much the magnet points away from the north; but it is necessary also to determine the vertical pull which is exerted upon the magnet, and also the magnitude of the horizontal force. These observations are not taken by ordinary seamen, and therefore they must be made by a special expedition. On all these grounds, therefore, I contend that there is the greatest possible need for such observations. I may add that, though such regions are not at present traversed by any large number of merchant vessels, nevertheless, there is a certain amount of traffic across the outskirts of the Southern ocean; and it is known that the ships thus engaged often go many miles out of their way, owing to the fact that the magnetic conditions of those regions are not known. I do not wish to lay too much stress upon this; but, nevertheless, it is true that in that very sunless region, where it is often difficult for the ships to determine their position by astronomical observations, the magnet practically fails them on account of our ignorance. The great scientific problem before us, as I have already hinted to you—though at present it is very much of a dream—is to learn to foretell what the magnet will do, and for this it is absolutely essential that we should know more about the magnetic conditions of the southern hemisphere. The methods of calculation which have been adopted for calculating the magnetic state of the Earth are not as useful as they otherwise would be, because we are unable to test the results, owing to our ignorance of the magnetic state of the southern regions. I can only add, both on account of the admitted ignorance of magneticians as to facts which an expedition could discover, on account of the magnitude of the problem involved, which is second only to the problem of gravitation, and on account of the practical results which would follow, an antarctic expedition is of the very greatest importance, and we may sincerely hope that the Government will be willing to help it.

Sir CLEMENTS MARKHAM: We do not propose to take up your valuable time any longer. We sincerely trust, from what has been said, and what we have represented in our letter, that Her Majesty's Government will take our request into their favourable consideration.

Mr. BALFOUR: Sir Clements Markham, Sir Joseph Hooker, Lord Kelvin, and gentlemen, I am sorry that I am here alone to represent the Government, and that neither the Prime Minister nor the Chancellor of the Exchequer has been able to accompany me and to listen to the interesting and important expression of scientific views which has just been made by a body which I think we may say without exaggeration is, perhaps, as representative of English science at the present moment as any body that could well be collected into one chamber. I feel sure that had they been here they would have been deeply impressed by the opinions that you have put forth, and by the weight of authority which evidently lies behind those opinions. I can only trust that I shall be able to convey to them the full strength of the impression which you have made upon my mind.

I, for my own part, fully recognize that if, as I think, expeditions to the poles of the Earth or towards the poles of the Earth are eminently desirable both on practical and on purely scientific grounds, those expeditions are, perhaps, even

more important towards the antarctic pole than they are towards the arctic, for we know much less at present about the antarctic than we do about the arctic regions; and the actual area of this unknown but immense portion of the Earth's surface is much larger in the case of the southern than it is in the case of the northern pole. I gather, also, from what has fallen from more than one member of the deputation, that there are problems—meteorological and geological problems—connected with the antarctic regions which have no precise parallel, and cannot have a precise parallel, at the north pole, where the configuration of earth and ocean presents features so very different from those which meet us in the southern hemisphere.

I am not qualified to dogmatize upon the precise practical value of those magnetic investigations which Prof. Rücker has just explained to us, and on which the whole deputation lay so great and, as I think, such just emphasis. But I think it must be important to the world at large, and important most of all to that country which is especially interested in all that appertains to navigation, to carry out to the utmost in our power every scientific experiment which will enable us to navigate with security this vast oceanic area. So much, perhaps, is obvious. I, however, should not be representing my own personal convictions—and I am speaking in this matter only for myself—if I for a moment let it be thought that in my judgment the scientific investigations which directly, immediately, and obviously lead to some practical results, are the only ones which it is worthy of a great nation to pursue. I take a different view—a view based upon the scientific experience of the past. If our predecessors in the last two centuries had taken any narrowly utilitarian view of their work, it is manifest that our ignorance of the planet on which we live would be much more profound than it is at present; and it would not be creditable to an age which, above all other ages, flatters itself that it is scientific, if we were without reluctance to acquiesce in the total ignorance which now envelops us with regard to so enormous a portion of the southern hemisphere of our planet. For my own part, therefore, I entirely agree with all that has been said upon the important practical issues that may be anticipated from any expedition which we are able to send forth from these shores; but I by no means limit my interest to such practical results. The things that we go forth directly to observe, and with the fore-ordained intention of observing, are doubtless of the highest importance; but I should be greatly surprised if the expedition does not come across a great many phenomena which we did not expect to observe, and which will throw a novel light upon many of our most important scientific theories, meteorological, geological, biological, and magnetic.

If this expedition is sent forth, as I hope it will be, adequately equipped, it certainly should add to our satisfaction that we shall be able to co-operate with a German expedition animated by the same scientific interests as our own. Such co-operation is valuable, and must be valuable, from every point of view; and it will, among other things, have the effect of strengthening, if such strengthening be indeed necessary or possible, the cosmopolitan and international character of true science. It perhaps adds to my satisfaction, speaking for the moment simply as a politician, that, if I rightly understand the matter, there cannot be any territorial rivalry between any of the countries engaged in antarctic exploration; and that such rivalry as there may be, must be of a purely scientific character. I do not imagine that the most ardent advocate of Imperial expansion is likely to find a sphere for carrying out his ideas in Victoria Land or in the regions around Mounts Erebus and Terror. I do not know, gentlemen, that I need say anything more on the general aspect of the question. You will, I suppose, be glad that I should leave that general aspect, and say something definite as to the line the Government

propose to take in respect to the demand that you have come here to press upon them.

I confess I could wish that the Chancellor of the Exchequer were present to represent the views of the Exchequer upon this matter. After all, it is a question for him, and I should have been glad if he could have explained fully his views to you upon the present occasion. If he were here, I think he would say, and say in my opinion with great justice, that one of the difficulties that beset the Treasury whenever any new demand is made upon them, is that such a demand cannot be considered simply in itself and by itself, in consequence of that ineradicable tendency in human nature to found new claims upon ancient precedents. I know that the present Chancellor of the Exchequer—and every Chancellor of the Exchequer, I do not care who he may be—is never at liberty to consider a request made to him in its natural isolation. He is bound to consider it as possibly a precursor of other demands of a similar character.

I am sure, if the Chancellor of the Exchequer were here to-day, he would tell you that, if he can in any way meet the wishes of the deputation, such action on his part must be regarded, not as a reason for giving something more to some future deputation upon some other subject, but rather as a reason for giving less. But with that caution—which, in the absence of my right honourable friend, I feel bound to give on his behalf—I think I should be not raising undue hopes in the minds of my audience if I say that I believe the Chancellor of the Exchequer will find it in his power to give substantial aid to the great project which you have on hand. I do not of course say that that aid will reach the limit of the largest wishes or desires that have been expressed, but I hope and I believe that it will be sufficient to enable us to send out this expedition in a manner not unworthy either of the great Societies which have interested themselves in this project, or of those liberal members of the public who have subscribed out of their private means in its support; but also that it will not be unworthy of a country which has done more than any other country in the past to further expeditions similar in their character and in their objects to the one which you desire to send forth.

Sir Clements Markham having informally thanked the right honourable gentleman for his courtesy in receiving them, the deputation withdrew.

As a sequel to the deputation, the following letter has been received from the Treasury:—

Treasury Chambers, July 3, 1899.

My Lord,—

I am directed by the Lords Commissioners of Her Majesty's Treasury to inform you that the First Lord has laid before the Board the Memorial signed by your Lordship as President of the Royal Society, by the President of the Royal Geographical Society, and by other distinguished representatives of various branches of Science, by which Memorial application is made for a Government grant in aid of the expedition now being organized by the Royal Society and the Royal Geographical Society for the exploration of the antarctic regions. This application has received the careful consideration of Her Majesty's Government, and I am directed to inform you that they are prepared to ask Parliament for grants amounting, in all, to £45,000 towards the expenses of the proposed expedition, provided you are able to assure them that not less than an equal amount will be forthcoming from other sources, so as to enable the scheme to be efficiently carried out.

In making this announcement, I am to call attention to the latter part of the

speech of the First Lord to the deputation which waited on him on this subject, as indicating that Her Majesty's Government must not be regarded, in making this promise, as inaugurating a new era of more extensive grants than formerly from the Exchequer in aid of scientific enterprises. Rather, it is to be understood that the very exceptional importance of the present scheme, so strongly represented by the deputation, is being recognized by the promise of a special grant.

At the present time, it is only necessary to add that the applications to Parliament for instalments of the grant will be spread over four years, of which 1900–1901 will be the first.

I am to ask you to be so good as to communicate this decision to the other signatories of the Memorial.

I am, My Lord,

(Signed) FRANCIS MOWATT.

LORD LISTER,
President of the Royal Society,
Burlington House.

NOTES ON THE SURVEY OF COLONEL J. R. L. MACDONALD'S EXPEDITION.*

THE survey was a combination of compass traverses and plane-table work, supported by astronomical observations. The traverses were made by prismatic compass and pedometer, and were plotted to scales of from 4 to 2 geographical miles to the inch. The variations of the compasses were frequently checked by astronomical observations. Each officer had tested his pedometer readings over a known distance, and the difference of latitude also afforded an additional check. Altitudes of camps were taken by aneroid barometer, the height above the sea of Mumia's station, as given by the Preliminary Railway Survey of 1891–92, being taken as a datum point. Corrections were made according to the hour of observation for the diurnal wave, the curve for which was from time to time plotted. Heights of hills were obtained by triangulation with theodolite, allowance being made for curvature of earth and terrestrial refraction.

The traverse was plotted daily on to a plane-table sheet on a scale of 4 or 8 geographical miles to an inch, and the plane-table used to secure additional detail. The plane-table work also gave a check on the traverse work, whenever, as generally happened, intersections could be obtained from previously determined hills. In favourable ground this almost amounted to a plane-table triangulation. Observations for latitude were obtained by observing north and south stars with theodolite.

Time was obtained by observing the sun or stars with theodolite or sextant. Longitude was obtained for the most part by azimuths and difference of latitude. A great deal of the country traversed, with its prominent peaks, was very favourable for this method of determining longitude, especially as our routes had plenty of northing. Longitude by chronometer was also used. The rating of the chronometer was checked by azimuth and difference of latitude, as well as by observations repeated at the same points going and returning; as certain points were repeatedly visited, good opportunities for checking the marching rating occurred. Some very long bearings were obtained, notably two of about 100 miles each.

Absolute longitudes by occultations were frequently attempted, but were not successful owing to clouds.

The absolute longitude of Titi was determined by lunar distances. One observer took the distances by a 6-inch sextant on a stand, while another simultaneously

* For paper, see p. 129; map, p. 240.

took the altitudes with a theodolite. The mean of the results differs by two minutes of arc from the longitude determined by azimuth and difference of latitude. The latter longitude is used in the map.

J. R. L. MACDONALD, Lieut.-Colonel.

THE MONTHLY RECORD.

THE SOCIETY.

South Australia and the Antarctic Expedition.—Lord Tennyson, the Governor of South Australia, has at the request of the Adelaide Branch of the Royal Geographical Society of Australasia communicated to Sir Clements Markham, and to the Royal Geographical Society, the congratulations of the Adelaide Society on the success attending the efforts to equip a national Antarctic Expedition. In his speech at the annual meeting of the Branch in Adelaide, Lord Tennyson, who presided, gave an eloquent address on the functions of geographical societies and the importance of the study of geography. In concluding, he moved the congratulatory resolution in these words:—"Before I resume my seat I would respectfully ask you to grant me your authority, if it is found consistent with your business to-day, to forward the hearty congratulations of your Society to that most popular of all societies, the Royal Geographical Society of Great Britain, on their zeal and on the zeal of their president, Sir Clements Markham, on behalf of the proposed Antarctic Expedition, and on the co-operation with them of our Teutonic cousins, the German people, in that great scientific enterprise." This was unanimously agreed to.

EUROPE.

Vienna the Site of the Earliest Triangulation.—Some new facts respecting the earliest use of triangulation in surveys were brought forward by Siegmund Wellisch, in a paper read in April last before the Austrian Society of Engineers and Architects. It has previously been supposed that the discoverer of the use of triangulation was the Dutchman Willibrod Snellius, who as early as 1615 carried out his famous measurement of a degree by the aid of this method. Herr Wellisch, an Austrian engineer, has now proved, on the evidence of manuscript notices lately discovered, and by means of careful test measurements, that so far back as 1547, triangulation was already employed for the plan of the city of Vienna prepared in that year, of which the original engraving, on six copper-plates, is still preserved in the Vienna Museum. The author of the plan was the mechanic and engraver, Augustin Hirschvogel of Nürnberg, who had become domiciled in Vienna. Wellisch has proved beyond a doubt that Hirschvogel not only worked from the greater to the less in the measurement of angles, but also made use of the principle of back-sights in determining the position of the point of observation, both principles forming the essence of triangulation. The accuracy of the survey is very high, inasmuch as the average error amounts to no more than 5·4 per cent. Snellius still retains the honour of being the first to formulate the method of triangulation with academical precision, while to the Swabian Wilhelm Schickhart belongs the merit of having for the first time carried out a complete territorial survey (that of Württemberg of 1624–35) on the basis of an independent system of triangulation. England, too, takes a share in the history of the science in the person of John Collins and Richard

Townley (1671), while France can boast of her Laurent Pothenot (1692). The above-mentioned survey of Vienna, however, took place no less than sixty-eight years before Snellius carried on his operations, so that in point of time Hirschvogel occupies the first rank, and the city of Vienna must henceforth stand out as the place where the principle of triangulation was first employed.

Transformations in the Bay of Mont-Saint-Michel.—It is well known that great changes in the north-western coast-line of France have taken place since the commencement of our era, due in part to slow oscillations in the level of the land. A practical question has lately arisen in this connection, owing to the conflict between the utilitarian aims of those who desire to reclaim as much land as possible from the sea, and the more conservative views of the lovers of the picturesque. The locality in question is the neighbourhood of the Mont-Saint-Michel, which is likely to lose its romantic charm if the utilitarian schemes alluded to are carried out. A succinct review of the whole question, including a sketch of the changes which have taken place within historic times, appears in the fourteenth number of the *Tour du Monde* for the current year. There seems little doubt that in the time of the Romans, Alderney, Jersey, and the Chausey islets were all united to the mainland of Cotentin, while Guernsey and Sark formed but one island. The Bay of Mont-Saint-Michel, as far as the Chausey isles, was occupied by the forest of Scissy, traversed by a Roman road. The gradual lowering of the level of the land had already somewhat diminished its area when, in 709, after an earthquake, the sea covered all the low-lying parts of the coast, leaving only the rocks of Tombelaine and Mont-Saint-Michel still above the surface. The unusually strong tidal action in the bay has since brought in immense quantities of sand and detritus, and new land has gradually been formed. Reclamation had, however, been possible only on a small scale, until in 1856 a strong company obtained a concession, and, by the building of dykes, caused the sea to retreat at the rate of a kilometre in ten years. Already much damage has been done to the ramparts of Mont-Saint-Michel by the concentration of the tide into a narrower compass, and it is suggested that the principal dyke should be pierced for a distance of 200 yards, connection being supplied by a drawbridge. On the other hand, schemes are on foot for turning the whole bay into dry land, in which case the mount would be merely a rock rising above the coast-line. The most feasible scheme is for the construction of dykes from the Bec d'Andaine to the Tombelaine rock, and from the latter to Mont-Saint-Michel; but it remains to be seen whether the champions of the artistic or of the useful carry the day.

ASIA.

Flora and Fauna of the Altai.—Last year Mr. H. J. Elwes made a journey into the Altai for the purpose of studying the fauna and flora of the range, and a sketch of the chief results has appeared in the *Journal* of the Linnean Society (*Zoology*, April, 1899). Although the route followed led over no new ground, some interesting facts are mentioned respecting the physical features of the country, and the distribution of plants and animals therein. Mr. Elwes proceeded *viâ* Barnaul and Biisk to the headwaters of the Ob, his furthest point being near the source of the Chuja river, a tributary of the Katuna. It had been part of his programme to explore the little-known upper Yenesei, but guides were not to be found either for this region or for the journey across Northern Mongolia to Lake Kosso-gol. The Chuja rises in a wide open valley about 6000 feet above the sea, in which is a frontier market named Kuch Agach. From the bare and treeless mountains whence the Ob headwaters rise, the sources of the Irtish are said to have been seen, as well as those of the Kobdo river and of the Kemchik, though according to our maps they

would lie on the further side of the Southern Altai, itself visible 80 or 90 miles to the southward. Mr. Elwes places the eastern limit of the Altai at the boundary of the Government district of that name, but in so doing apparently leaves out of consideration the Southern Altai in Chinese territory. He is inclined to place the division between the eastern and western portions of the Holarctic Region further west than the Yenesei, as he found many species of butterflies and some birds previously only known from Dauria and Amurland. He paid special attention to the wild sheep (*Ovis ammon*) and to the great stag of the Altai, as to exact relationship of which opinions differ. The number of species of butterflies was surprisingly large, and the Alpine flora particularly brilliant. Both the fauna and flora are influenced by the great extremes of heat and cold in the Altai, and by the heavy snowstorms which occur throughout the summer. A marked change was noted on crossing the watershed between the Chuja and Bashkaus valleys, the vegetation becoming more European in character, while dense forests of pines and spruce took the place of the thin larch woods of the drier region. Mr. Elwes gives an incomplete list of the English travellers who preceded him in the Altai, omitting the names both of Atkinson * and Mr. Ney Elias. He is also incorrect in stating that Grum Grijimailo is the only European who has seen the wild horse of Prjevalsky in its native haunts.

M. Rijnhart's Journey in Eastern Tibet.—It may be remembered that when Captain Wellby and Lieut. Malcolm reached the borders of Kuku Nor, after their adventurous journey across Northern Tibet, they were hospitably received by a Dutch missionary named Rijnhart, then settled at Tankar, not far from the Kumbum monastery. He was then meditating a journey towards Lhasa, which he has since carried out, accompanied by his wife and infant son. The journey, of which a short account is given by M. Grenard in the *Comptes Rendus* of the Paris Geographical Society (1899, p. 124), was beset with hardships and dangers, and terminated disastrously, Madame Rijnhart having arrived alone at Ta-tsien-lu without certain knowledge of the fate of her husband, while their child had succumbed to the severe experiences undergone. The route followed cannot be laid down with certainty, but M. Grenard's knowledge of much of the country traversed enables him to throw considerable light on it. The party, after reaching Barong, in Tsaidam, took one or other of the routes to Lhasa, probably that followed by Prjevalsky and A—K, as it crossed the Chumar, one of the headstreams of the Yang-tse, and the well-known Tang-la pass. M. Rijnhart hoped, owing to the smallness of his party, to pass across the Lhasa territory unobserved, but the hope proved fallacious. After advancing southwards beyond the Ta-tsang pass (apparently the Tajang of A—K), he was forced to turn north-east by the northern route to Ta-tsien-lu—that followed in 1894 by MM. De Rhins and Grenard, the only Europeans who had previously travelled by it. After crossing three important streams, the Ta-chu (Dza-chu, or upper Mekong) was reached, and the party was attacked by Tibetans while attempting to find a practicable route across the stream. M. Rijnhart's men all fled, leaving him alone with his wife and one sorry horse. The river was crossed, but, seeing some tents on the opposite bank, M. Rijnhart re-crossed to endeavour to obtain assistance. Since then he was not seen again by his wife, who, after waiting several days and losing all hope, made her way, amid incredible difficulties, to Chinese territory. It is thus uncertain whether M. Rijnhart was murdered or merely taken prisoner by the Tibetans.

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* That Atkinson's account was in the main trustworthy was the opinion of Mr. Elias, while his descriptions agree well with those of Mr. Elwes in the case of localities visited by both.

M. Bonin's Journey in China.—M. Bonin has during the last two years been engaged on a new journey of exploration in the Chinese empire, accounts of which have from time to time appeared in the *Comptes Rendus* of the Paris Geographical Society. From the first number for the present year we learn that from the upper Yang-tse above Swi-fu he has followed a hitherto undescribed route across the mountainous country of the Leang-Shan, inhabited by the Lolos, or Mantse, as he prefers to call them. He has collected information respecting this people which he hopes will fill up some blanks in our knowledge respecting them. The attack on his party by the Chinese necessitated a modification of his plans for entering Tibet (which he had hoped to do by way of Tali), as it became requisite for him to proceed to Ta-tsien-lu to communicate with the French Consul. *En route* for that place from Kien-chang (the Caindu of Polo), he hoped to travel still over new ground. A subsequent letter announces his return to Shanghai previous to carrying out the last part of his programme. In addition to the work done by M. Bonin himself, a survey of the Yang-tse above Swifu is said to have been carried out by Captain de Vaulserre, the second in command. A sketch-map of M. Bonin's route accompanies the first letter.

A Journey in Shantung.—An interesting journey in the Chinese province of Shantung, made last year by Herr Gaedertz, a German engineer, on behalf of a Hamburg syndicate interested in mining and railway construction, is described in Nos. 3–5 of *Petermanns Mitteilungen* for the current year. A preliminary trip was made to the walled city of Wei-hsien, one of the most important places on the route to Tsinan-fu, both from Kiau-chau and from Chifu. Skirting the eastern shores of Kiau-chau bay, Herr Gaedertz struck north-west from its northern point, and, after crossing the Ta-ku-ho, reached the Yuen-liang-ho—the canal which unites the former stream with the Kiau-ho, and thus the waters of Kiau-chau bay with those of the gulf of Pechili. In its present state the canal serves only as a drainage channel during the rains for the great plain through which it passes, and which is in great part inundated at that season. This would seem to be the origin of the Lake Pi-mu-ho, which has figured on former maps, but of which the traveller could hear nothing. The canal was always, in Herr Gaedertz's opinion, a one-level canal without locks. The plain, which extends to the Wei-ho, is mainly occupied by cornfields, the villages being embowered in fruit-trees. The soil appears to be chiefly loess, in which the track has worn deep gullies. The people were generally well-mannered, but inquisitive; apart from the missionaries, whom, as they wear the native dress, they do not regard as foreigners, they have rarely seen a European. After returning to the German port of Tsin-tau, Herr Gaedertz again reached Wei-hsien, this time by a more southerly route, crossing Kiau-chau bay and passing through the city of the same name. At Ma-tau, the new customs station north of the bay, an active trade in the country products was observed. After passing Ngan-kiu, a populous and busy town south of Wei-hsien, a steep ascent had to be made, and here the wheelbarrow-men took advantage of a strong southerly breeze as a means of propulsion by sails. On the plateau above both sandstone and limestone were met with. Beyond Wei-hsien the way led along the northern foot of a series of limestone escarpments, the cultivated plain extending northwards as far as the eye could reach. Tsing-chau-fu, famous as the seat of the Ming dynasty, and for its production of silk, was left to the south. It lies in a wide valley by which the mountains are broken. An ascent was made to the temple-crowned summit of the Yo-shan, from which a sea of mountains was visible to the south. Beyond Chau-tsun, a town of 50,000 inhabitants and the emporium of the silk trade of Shantung, it was resolved to follow the track to the south of the Chang-pei-shan, the eastern summit of which had been ascended from the town. The

track is at present impassable for carts, but the route is regarded as practicable for the proposed railway. After leaving the Chang-pei-shan the route again traversed a plain, with limestone mountains to the south, until Tsinan-fu, the capital of Shantung, was reached. The city lies only 2 miles south of the Hwang-ho, on which its port, Lo-kau, is situated. Herr Gaedertz gives useful information as to the trade of the city, which is carried on to a great extent by the Hsiau-hsing-ho canal, to which it comes *viâ* Chi-fu and Yang-kia-kau, a port of transhipment on the gulf of Pechili. Petroleum, paper, sugar, and English linen are the principal imports, but the amount of trade is less than that at Chau-tsun. Crossing the Hwang-ho, as to which stream and its dykes he gives interesting particulars, Herr Gaedertz proceeded north-west over a well-peopled plain to Te-chau, crossing *en route* several channels which carry off the surplus water of the Grand Canal. The return journey was made by a more northerly route, which, before reaching Chou-tsun, passed along the northern edge of the Chang-pei-shan. Beyond this an excursion was made southwards up the valley of the Hsiau-fu-ho to Po-shan, which lies in the centre of the coal district, and is the chief industrial town of the province. It has pottery, glass, and iron works. The rest of the route did not differ materially from those followed in the previous journeys.

Observations on Mount Kinabalu.—Mr. H. T. Burls, writing from Gaya island, North Borneo, on April 25, sends us a short account of his recent ascent of Mount Kinabalu, which he undertook for the purpose of geological observations. The altitude of this mountain was measured by Captain Belcher from the sea as 13,698 feet, and Dr. Haviland had in 1892 explored it to the summit for the purpose of making botanical collections.* Mr. Burls, whose description of the mountain agrees with that of his predecessors, succeeded in reaching a point where the boiling-point thermometer read 191°·9 at an air-temperature of 49°, giving an altitude of 11,643 feet. The distance to the summit he estimated at only 400 feet, which would give the total height of the mountain as 12,043 feet. The upper 1200 feet was a surface of bare rock so steep that it was impossible to walk on it with boots, and, being unprovided with any substitutes, Mr. Burls was obliged to give in after covering two-thirds of the distance; but his Chinese servant and four Dusan carriers completed the ascent, and brought back a number of small pellucid quartz crystals found in crevices of the rock on the summit. He believes that large specimens of such crystals may have given rise to the legend that a great diamond was to be found at the top of the mountain, guarded by a huge dragon, which devoured so many adventurous Chinamen who went in search of the diamond that the mountain came to be called Kina Balu, which means "Chinese Widow." Bad weather was experienced all the time of the ascent. While on the mountain Mr. Burls never saw the sun after 11 a.m., when the summit became densely enveloped in mist, and before that hour the mist lay low over the surrounding country, a fully illuminated view of which could not be obtained. Rain fell every afternoon, and the damp threatened to spoil the photographs which were taken. The natives at Kiau said that it rains every afternoon throughout the year, but the season was a particularly wet one and the rain very heavy; on one occasion 2·06 inches of rain were collected in two and a half hours. The lowest temperature recorded was 44° on the night of April 13, at an elevation of 10,360 feet. Mr. Burls says that the central core of the mountain, which is of syenite, seems from a distance to be table-topped. His object was to see whether the sides were covered with sedimentary rocks, or whether there was any extensive area of metamorphic rock surrounding the mountain. He did not find

* See Dr. O. Stapf, "On the Flora of Mount Kinabalu," *Trans. Linnean Soc. Botany*, vol. iv. pt. 2, 1894.

any metamorphic rock; at 8800 feet there was a direct transition from limestone to syenite, the change being clearly marked by the form of the ground. The central peak is very ancient, and probably stood up as an island in the Devonian or Carboniferous sea in which the limestone was laid down. The limestone appears to be underlain by a shale, followed by a sandstone at 7175 feet; and Mr. Burls is of opinion that the original formation may have been that of a fringing reef.

AFRICA.

The Egyptian Sudan.—An instructive report on the Sudan, by Sir William Garstin, Under-Secretary for Public Works in Egypt, has lately been issued as a Parliamentary Paper. The first part is descriptive, and gives a detailed account of the hydrography, native tribes, resources, etc., of the region of the upper Nile, based on the latest information obtained early in the present year. The information with regard to the present state of the channel of the upper Nile and those of its tributaries, is especially useful. In March the Sobat had a depth of 20 feet, but its current was feeble, its waters being held back by those of the Nile. In flood-time the Sobat drives the Nile water on to the western bank, and its milky-white water (to which the eventual colour of the White Nile is largely due) is for a long distance separated from the greenish-black water of the Nile by a sharp line. It is not navigable in the dry season, but its discharge must at times be very considerable. The fort on its south bank is occupied by eighty men, whose health, despite the surrounding swamps, continues to be good. The Bahr-el-Zaraf is from 40 to 50 yards in width at the junction, and is apparently discharging more water than the Bahr-el-Jebel, or true Nile, probably because the latter is now blocked by the *sudd*. This begins within a few hundred yards of its debouchure into Lake No, and the closure of the water-surface is complete, the mass being perhaps 4 feet thick. At low water the Bahr-el-Ghazal has a depth of 8 feet, but in March its current was hardly perceptible. The writer lays stress on the great fertility of the land along the Blue Nile, which he thinks eminently adapted for wheat-cultivation. Wad Medani, on its west bank, 147 miles from Khartum, is the largest and most important town upon the Blue Nile, and seems to have almost taken the place which Sennar once held. Built on a high ridge of sand and gravel, it is regarded as the healthiest in the Gezireh. In the second part of the report, which deals with possible developments and the future of the Sudan, much attention is paid to the swamps of the upper Nile, and the possibility of improving the water-supply in Egypt by confining the river to one channel is discussed. Sir William Garstin lays stress on the loss of water by evaporation in the marshes, and thinks that the measures suggested might increase the supply during the summer months without risk of raising the flood-level of the river. On the Blue Nile irrigation is needed for the winter cultivation of wheat, and at this season Egypt could well spare the needed water-supply. A barrage might be constructed somewhere between Rosaires and Sennar. Progress in the Sudan must necessarily be slow, and an insufficient population must for years be the chief obstacle to prosperity. It is to be feared that the climate will levy a heavy toll in the shape of valuable lives, but the results to be hoped for should well repay the sacrifice.

The Nemensha Country, Algeria.—An instructive sketch of the physical and human geography of the Nemensha country, in the province of Constantine, is given by M. J. Blazac in *Annales de Géographie* (March 15, 1899). The district in question, which lies to the east of the Aures mountains, is really, M. Blazac says, quite distinct from the latter, which are formed by a series of anticlinal chains and synclinal depressions running from south-west to north-east, and due to a thrust from north-west to south-east, whereas in the north of the Nemensha

country a thrust in the perpendicular direction has also made itself felt, resulting in three anticlinal domes. Similar structures abound in Tunisia and in part of the province of Constantine, but those now under consideration form the southernmost outposts of the series. Owing to the effects of denudation, they have lost all their upper strata (Lower Eocene and Upper Cretaceous), and now form elliptical plains, sharply defined at the margin by continuous lines of heights, whilst older deposits (probably Trias) rise in isolated ridges from their centres. They are separated from each other by narrow synclinal depressions, which retain the newer strata, whilst a wider valley of the same character separates the westernmost plain from the Aures system. South of the domes lies the Nemensha plateau, on which the Eocene limestones become nearly horizontal, until they suddenly plunge beneath the sands of the Sahara. The drainage of the district is southwards towards the Shotts of Melrir and Rarsa. The collected waters of the three plains are in each case discharged through narrow gaps in the bounding heights, and the streams then as a rule traverse the plateau by deep gorges. The economic value of the district is very slight. It is entirely devoid of wood, the greater part of the surface being covered with *alfa*. The strata which once formed the cores of the domes and now appear above the surface of the plains abound in gypsum and various salts, and the streams which rise in them render much of the soil unsuitable for cultivation, though producing some pasturage. The population is generally grouped round the margin of the plains, where most of the springs emerge from the line of contact of the Cretaceous and Eocene formations. On the plateau the inhabitants become more and more scanty towards the south. The whole country was, however, occupied by the Romans, and the Nemenshas are probably Berbers, with some Roman blood in their veins. Ruins of old forts, probably intended as posts of surveillance against the predatory *Gaetuli* of the desert, are still seen in the cañons of the Wed Hallail.

Dr. Fischer's Journey in Marocco.—We learn from *Petermanns Mitteilungen* (1899, p. 151) that Dr. Fischer, whose journey in Marocco was referred to in the June number of the *Journal* (vol. xiii. p. 660), has returned to Germany with a rich harvest of results regarding the physical geography, topography, and climatology of the country. During his stay at Marakesh, where he was joined by Count Pfeil and Hauptmann Wimmer, he had been able to collect material for a large-scale map of the neighbouring country, which has been somewhat neglected by previous travellers. He also gained an insight into the history of the area of depression on the inner side of the Atlas, and its filling up by vast diluvial deposits. Having obtained the Sultan's letter of recommendation, the travellers went east to Demnat, and thence west-north-west to the Um-er-Rebia. Following where possible the little-known course of that stream, they reached Casablanca after an arduous march of thirteen days, during which intense heat was experienced. On the middle course of the river, where it flows through a vast steppe, a sun temperature of 150° Fahr. was registered in April. From Casablanca the coast was followed to Rabat, whence Dr. Fischer and Hauptmann Wimmer proceeded over the Gharb plain to Mekinez, and thence to Fez. One of the most important discoveries was that of a zone of black earth, of astonishing fertility, which stretches parallel to the coast from the Tensift to the Sebu. Samples of this earth have been brought home by Dr. Fischer to experiment upon. The luxuriance of the corn grown in the black-earth tract is due to the excessive deposit of dew, caused by the belt of cold water rising from the ocean depths.

The Uganda Railway.—The recently issued report by Sir G. Molesworth, who was last year commissioned by the Uganda Railway Committee to carry out a thorough examination of the position and prospects of the undertaking, supplies

welcome information on a variety of points connected with it. Particularly useful are the maps showing the exact route hitherto followed by the railway; for, although in the main the line suggested by Colonel Macdonald as the result of his reconnaissance has been adopted, numerous deviations have been shown to be necessary by the more detailed examination of the country which has since been carried out. This, as Sir G. Molesworth points out, was only to be expected considering the conditions under which the reconnaissance was executed, and he pays a high tribute to the care and ability with which this work was performed. The principal deviations are as follows: In surmounting the Rabai hills the railway runs along the water-shed, thus avoiding the cross-drainage and ravines. Near the Voi river the adopted route differs from both alternatives suggested by Macdonald, while the detailed examination of the Kikuyu escarpment has resulted in the discovery of a much easier descent than that first adopted, the line now staked out being described as a masterpiece of engineering skill. As is already known, an important modification has been introduced as regards the final section of the route by taking it across the Mau escarpment to Ugowe bay, but this section has not yet advanced beyond the reconnaissance stage. Sir G. Molesworth lays stress on the exceptional difficulties which have been encountered in the construction of the line, the country traversed being in great measure desert, sparsely populated, waterless and without resources, while a large portion of it is fatal to all transport animals. The great elevation to be attained, the sudden ascents and descents, the severity of the gradients and sharpness of the curves necessary to avoid expensive construction, involve difficulties equal to those of a mountain railway. In many places temporary diversions have been necessary in order to maintain progress; at the Kikuyu escarpment, *e.g.*, a rope incline will be employed for the lowering of the permanent-way materials. Other points touched upon are the difficult questions of water-supply, transport, employment of local labour, etc. The great importance of the railway as a civilizing agent is insisted upon, as well as the desirability, in the interests of the country, of its remaining under Government control. In view of the unsuitability of the present port of Mombasa, it is suggested that Kilindini, the railway terminus, should replace the former as the main distributing centre, the interests of Mombasa as regards dhow traffic being, however, safeguarded by the construction of a branch line on the same gauge as the main railway. A survey of Lake Victoria is also needed, and the question of water-communication on the lake requires prompt attention.

French Explorations on the Ivory Coast.—French explorers have during the last few years shown considerable activity in the interior of the Ivory Coast, with the double object of elucidating the geography of the Franco-Liberian frontier, and of discovering the best means of communication between the coast and the southern parts of the French Sudan. In 1896 an expedition was organized under Lieut. Blondiaux to reach the region in question from the north, and in February, 1897, the extreme outpost from this direction was reached. A sketch of the expedition appears in the first number of the *Comptes Rendus* of the Paris Geographical Society for the current year. Lieut. Blondiaux and his associates made extensive journeys in the basins of the Ivory Coast streams, on the hydrography of which much new light was thrown. The most important discovery was that the Fereduguba and other streams, which have been supposed to unite to form the upper Kavalli, really belong to the basin of the Sassandra, more to the east, which is therefore a stream of some importance. The Kavalli has its sources further west than has been supposed, being formed by the junction of the Diwu, which rises in the Nienimeba mountains, and describes the arc of a circle before flowing south, and the Nuon. The expedition surveyed the water-parting between the basins of the St.

Paul and Sassandra, which in part forms the Liberian frontier, and also explored the headwaters of the Bagoe, which rises in the Noölu mountains, whence it emerges by a narrow gorge. The French authorities, as we learn from a recent number of the *Bulletin de l'Afrique Française*, have lately decided to follow up M. Blondiaux's explorations by despatching an expedition under Lieuts. Woelfel and Mangin. From the south the exploration of the Kavalli has been prosecuted by MM. Hostains and d'Ollone, while further east an expedition under Captain Houdaille has executed surveys for a railway intended to tap the commerce of the bend of the Niger, as well as of the upper Komoe and Bandama basins (*C.R.*, Paris G.S., 1899, p. 166). The line will start from Grand Bassam and run north-west to Mope, in the Attie country, west of the Komoe. Thence Captain Houdaille recommends the construction of two branches, which may eventually reach Kong from the east and west respectively; but at present it is unnecessary, he thinks, to carry the line as far as that town. The forests through which the line would pass are said to be rich in timber.

Lakes in the Kasai Basin.—A characteristic feature of the river-system of the Kasai and Lulua near the junction of the two streams, seems to be the formation of lacustrine expansions of many of the river-beds. A series of such lakes, which are as a rule of comparatively small dimensions, has been brought to light by Mr. Verner, an American Presbyterian missionary of the Luebo mission, who has communicated some facts respecting them to the *Belgique Coloniale* (1898, p. 271, and 1899, p. 54). Two of the lakes occur near the mouths of the Lumi and Ikenye, which flow from the east into the Lulua and Kasai respectively near their junction. They are formed by the damming back of the waters by the large amount of sediment deposited at the mouths of the two streams mentioned. Others, which are drained by a tributary of the Kasai above the junction, seem to occupy fissures in the line of mountains south of the Lulua. An expansion of the Kasai at its junction with the latter has been named by Mr. Verner Lapsley Pool, after the founder of the mission, while that on the Ikenye has been named after Senator Morgan, who, as the United States representative in Brussels, took a foremost part in the recognition of the Congo State as an independent Power.

New Railway Project for the Congo State.—A recent number of the *Mouvement Géographique* (1899, No. 26) contains information respecting a newly adopted project for opening up communication with the eastern parts of the Congo State by means of a railway. On the completion, a year ago, of the Lower Congo railway, which, in conjunction with steamer navigation in the middle basin of the river, now supplies rapid means of transport as far as Stanley falls, schemes were suggested for the extension of communication with the more outlying parts of the territory. The principal lines of railway then considered desirable were, one to Lake Tanganyika from the highest navigable point on the Kasai system, and a second to the upper Nile by way of the Welle. For these is now substituted a single scheme, which aims at effecting both objects. From Stanley falls it is proposed to construct a line eastward through the great forest to a point near the watershed in the direction of the Central African lakes, whence it would branch north and south to Lakes Albert and Tanganyika respectively. Such a scheme is bound to present great difficulties, the length of the lines being estimated at 2000 kilometres, or 1250 miles. A study of the route has, however, been decided upon, and for this purpose M. Adam, an experienced engineer, started for the Congo early this year, supported by an efficient staff.

A Game-preserve in British Central Africa.—An order has been issued by the authorities in Northern Rhodesia, setting apart the great Mweru swamp, between the lake of the same name and Tanganyika, as a game-preserve, shooting

being allowed there only by special permission. It is hoped that by this means the elephant and other large mammals of Central Africa may be saved from extermination.

AMERICA.

The Everglades of Florida.—The latest contribution to our knowledge of the strange country which occupies the southern portion of Florida is a pleasantly written narrative of a journey made across the "Everglades" in the winter of 1897–98, by Lieut. Hugh L. Willoughby, late of the Rhode Island Naval Reserve. Owing to the peculiarly difficult nature of the country, a considerable portion of its surface had been absolutely untraversed by white men, though affording a safe asylum to the last remnant of Seminole Indians. The two previous expeditions—that of Major Williams (1883) and of Mr. Ingraham (1892)—had traversed the western and northern parts of that region, but the central and south-eastern portions had remained unknown, various legends being current as to the existence of fertile islands amid the sea of grass and water. Lieut. Willoughby therefore resolved to cross in a north-easterly direction from the western to the eastern coast of the peninsula. Having provided himself with two specially constructed Canadian canoes, and secured the services of a hunter named Brewer, he sailed, in a small sloop, round the southern coasts of Florida and up the Harney river, which debouches amidst the "Thousand island archipelago." *En route* he made an unsuccessful attempt to secure specimens of the American crocodile, which has its sole habitat in the little-known creeks and sounds by which the coast is fringed, and also spent some time surveying the labyrinth of channels which intersect the archipelago above-mentioned. His main work began, however, on reaching the source of the Harney river in the mysterious Everglades. Heavy bunches of grass, including the dreaded saw-grass, were soon encountered, and the whole trip was a constant battle with this formidable obstacle, which is often almost impenetrable. The substratum of the whole region is coralline limestone, above which is a varying layer of mud (occasionally absent altogether) water covering the whole except where occasional islets rise a few feet above the general level. The vast body of water cannot be accounted for by the rains only, and large quantities were often seen welling up from holes in the limestone. The popular impression that the Everglades form a vast malarious swamp is, Lieut. Willoughby says, totally incorrect. The water is pure, and no stagnant pools can be found, while in the daytime the cool breeze has an undisturbed sweep. After five days' travel the canoes had reached the centre of the tract, but an impenetrable line of saw-grass, running north and south, then necessitated a long zigzag southwards. Later the shallowness of the water caused another difficulty, and it was only after strenuous exertions that the edge of the firm ground on the east was reached at the end of the thirteenth day. The book contains some details respecting the animal life of the Everglades, the principal forms seen being terrapins and turtle, otter, cormorants, blue heron, and a large rail known as the limpkin. Deer were frequently started, some being seen in the very centre of the Everglades; while snakes, some of very large size, abound. The illustrations, from the author's photographs, give a vivid idea of the unique nature of this tract of country.

The Increase of Aridity in the Western United States.—In a recent article in the *National Geographic Magazine* (May, 1899), Mr. J. B. Leiberg examines the evidence of the forests as indicating that a progressive change of climate in the direction of aridity is observable at the present day. The title of the paper, "Is Climatic Aridity impending on the Pacific Slope?" suggests the treatment of the question, at the outset at least, as an open one; whereas the writer practically takes for granted the fact that aridity is progressing, and merely shows the effects

noticeable in the case of forests. Dividing the area under consideration into zones, according to the amount of atmospheric precipitation, he examines each in order, and notes the disturbances of equilibrium manifested by the characteristic species of trees, which are almost everywhere conifers. The comparatively few species represented, therefore, leaves a very narrow margin for the evolution of new forms, most of the types west of the Rocky mountains possessing the power of adaptation only in a very limited degree; so that complete deforestation is the ultimate result of the encroachment of arid conditions. The extinction of species within given areas is marked by gradual loss of reproductive power in the individual trees, resulting first in the crowding back to more humid tracts of the most decidedly moisture-loving species, and next in the gradual extinction of those by which they are replaced. Of the five zones defined, the arid regions are now bare of trees, but present evidence of having once borne a forest covering. The semi-arid tracts—covered only with junipers—show a gradual diminution in the extent and density of the forests, which consist mainly of old trees. In the sub-humid belts, two of the characteristic species exhibit clear traces of yielding to the semi-aridity, while two others are doomed to still more rapid extinction owing to their inability to adapt themselves to changes of temperature. The lodge-pole pine (*Pinus Murrayana*) possesses the highest power of adaptability, and promises to become the dominant species throughout both the sub-humid and humid tracts. In the last-named, which are chiefly limited to the mountain regions, not only are traces of the encroachment of sub-humid conditions apparent, but occasionally spots of true aridity occur. Many of the trees and shrubs of the lower belts have penetrated to the humid tracts, while the typically humid forests present detached groups, entirely surrounded by forests of other types. In the Bitter Root mountains the absence of a timber-line even at a height of 10,000 feet accords with a possible rise of mean annual temperature consequent on the extension of drier conditions. It may be noted that in another paper in the same magazine, Mr. H. Gannett remarks that the present temperature and moisture conditions do not appear to meet the requirements of the red-wood forests of the coast, of which he gives an interesting description.

The Franco-Brazilian Contested Territory.—A short account of the territory under dispute between France and Brazil, by M. S. Brousseau, appears in the March number of the *Comptes Rendus* of the Paris Geographical Society. After referring to the discovery of gold in 1894 by Clement Tamba, an illiterate Negro of Cayenne, and Pierre Villiers, also of that town, by which discovery the public attention was at once turned to the disputed territory, M. Brousseau sketches briefly the physical features, geology, and native population of the country, his knowledge of which is based on journeys made in 1894. During these journeys, he was able to fix the position of the sources of most of the streams between the Oyapok and the Amazon. The geological formations represented in the territory are, as in French Guiana, mainly Laurentian and Huronian, and consist of gneiss and granite, with schists, ferruginous sandstone, etc., and eruptive masses of diorite, diabase, and quartz. The climate is said to be most healthy, thanks to the action of the sea-breezes. The present French claim extends over the whole country south of Dutch and British Guiana, as far as the Rio Branco, and is based solely, as regards the interior, on certain ambiguous clauses in the treaty of Utrecht, no pretext of actual occupation being, of course, possible. As, therefore, the contested territory adjoins, in part, the possessions of Great Britain and Holland, these two powers are, to a certain extent, interested as well as Brazil in the final settlement of the question.

Italian Expedition to the Amazon Valley.—We learn from the *Bollettino*

of the Italian Geographical Society, that a scientific expedition, under Dr. L. Buscalione, set out in March last for the Amazon valley. The principal objects of the journey are botanical, and the region specially chosen for research is the province of Manaos. It is hoped, however, that some results of geographical value will be obtained by Dr. Buscalione, who is supported by a grant from the Italian Geographical Society.

Recent Explorations on the Madre-de-Dios.—Much attention has of late years been paid to the investigation of the river-system of the Madre-de-Dios, on a correct knowledge of which the ultimate determination of the boundary between Peru and Bolivia depends. The explorations of Colonel Pando in 1892–93, and of Colonel Muñoz in 1894, have been already referred to in the *Journal* (vol. vii. p. 187, and vol. x. p. 443). From the second of these it appeared probable that Colonel Pando was in error in identifying a tributary which entered the main stream in 69° 43′ W. of Greenwich with the Inambari, and the correctness of this surmise has since been proved by Colonel Pando himself. This officer was in 1897 commissioned by the Bolivian Government to continue his explorations, in conjunction with Señor Varnoux, and especially to fix astronomically the position of the confluence of the Inambari with the Madre-de-Dios. A pamphlet was last year published by the Geographical Society of La Paz, containing a report on the first stage of Colonel Pando's expedition, from which some idea may be gathered of the results of his explorations, though all the details are not quite clear. The expedition divided near the part of the Cordillera whence spring the Tuichi, Saqui, and Sina, Señor Varnoux being commissioned to explore the sources of these streams, while Colonel Pando proceeded by way of Buturo, on the Tuichi, to the lower course of the Saqui, the direction of which had previously been matter of doubt. This journey led to the exploration of a number of streams, including the Saqui, or Tambopata, which unite in a magnificent valley before entering the plain, and finally join the Madre-de-Dios in 69° 43′ W., the mouth of the Inambari being further west. The Heath and Madidi are both streams of the second rank, and take their rise in the last spurs of the chain which dominates the plain of Caupolican. We have not yet received details respecting the conclusion of Colonel Pando's exploration, but a recent number of the *Comptes Rendus* of the Paris Geographical Society (1899, No. 4) contains the account of a journey undertaken in 1897 by M. Villerobe, on behalf of a French syndicate, with a view to finding a good trade route from the Amazon to Northern Bolivia, by way of the Ucayali and Madre-de-Dios. From Cuzco M. Villerobe proceeded north to Iquitos, and then, reascending the Ucayali and Urubamba, crossed the narrow watershed which separates the latter from the Manu. This stream was descended into the Madre-de-Dios, which was itself followed downwards to the Madeira. A stream entering from the south was taken for the Marcapata, whilst the Inambari, whose mouth, M. Villerobe says, no European had hitherto seen, was reached three days later. It was ascended for six days, a chain of snowy mountains being visible to the south after the third day. In spite of its great volume, the river is useless for navigation, by reason of the violence of its current. On account of its large size, M. Villerobe gives its name (Inambari) to the lower course of the Madre-de-Dios, the use of which latter name he somewhat unsuitably limits to the upper branch which descends from the direction of Cuzco. For communication with Europe, he favours the idea of a light railway from the Aquiry to the mouth of the Orton.

Disaster to an Expedition in the Gran Chaco.—An expedition for the survey of the Pilcomayo river, under the leadership of Signor Enrique Ibarreta, has, it is said, been massacred by the Indians of the Chaco, on the borders of Argentina and Paraguay. No news having been received of the expedition for

some time, an auxiliary party was despatched to make inquiries, with the result that the fears which had been felt for the explorer and his companions were confirmed.

AUSTRALASIA AND OCEANIC ISLANDS.

Exploring Expedition to the Pacific Ocean.—Arrangements are now being completed by the United States Commission of Fish and Fisheries for a marine scientific expedition to the mid-Pacific ocean. The Fish Commission steamer *Albatross* is to be employed for the work. We learn from a recent article in *Science* that the *Albatross* will sail from San Francisco about the middle of August. On the passage to Tahiti, dredging and sounding will be carried on at regular intervals on an almost wholly unexplored section of the sea-bottom. Tahiti will be made the headquarters while the Paumotu islands are being explored. After returning to the Society islands, the *Albatross* will visit the Tonga, or Friendly islands. The vessel will next sail for the Fiji islands, and from thence to the Marshall islands, visiting a number of the Ellice and Gilbert islands on the way. Six or seven weeks will be devoted to the exploration of the Marshall islands, about whose fauna very little is known. Between the Marshall islands and the Hawaiian islands, and between the latter and San Francisco, a distance of over 4000 miles, a line of deep-sea dredgings will be run. Prof. Alexander Agassiz is to have charge of the scientific work. The *Albatross* is expected to return to the United States early in April, 1900, after a voyage of 20,000 miles.

Relics of La Pérouse's Expedition.—It is stated that the British yacht *Lady St. Aubyn*, which returned to Sydney at the end of last year from a cruise in the Pacific, brought from Vanikoro, in the Santa Cruz group, a large number of relics of La Pérouse's celebrated expedition. They consist of musket-balls and portions of muskets, gold and silver coins, etc.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Mechanical Composition of Wind-deposits.—The results of an investigation on this subject, carried out by J. A. Udden, have lately been published in Rock island, Illinois, as the first number of the Augustana Library Publications. The object of the study was to discover how the mechanical composition of wind-deposits changes under varying circumstances of deposition, with a view to the more certain identification of such sediments, wherever found. Samples of different kinds of material, including gravels, sand, and atmospheric dust, were collected and separated into grades of different coarseness, the percentage of weight for each grade being then determined. Eleven different grades were defined according to the size of the particles, from coarse gravel with a diameter of 8 to 4 mm. ($\frac{5}{16}$ to $\frac{5}{32}$ inch), to very fine dust, varying between $\frac{1}{128}$ to $\frac{1}{256}$ mm. The results are given in the form of tables, showing both in figures and diagrammatically the proportions of each grade in each sample. It was found throughout that a certain grade was present in greatest quantity, while the other grades were less represented in proportion to their distance from the medium. Summing up the results of the study, the writer points out that the great effectiveness of the atmosphere as a sorting agent tends to produce uniformity in the deposits, lamination being rarely if ever seen except in drifting dunes. The sediments are also rendered uniform by the elimination of the finest particles, very fine dust rarely exceeding 3 per cent. of the total weight, and not being specially abundant even in the case of material caught on the calmest days. The finest sand is probably never carried at a single leap more than a few miles, while dust may, according to its degree of fineness, be carried 200 to 1000

miles, or even round the globe. The different grades of materials are so far separated from each other in the direction of wind-movement, that even with considerable changes in velocity, the principal areas of deposition of the different grades will on the whole remain distinct. Mr. Udden remarks in conclusion that the loess of the Mississippi valley resembles atmospheric sediments considerably in its mechanical composition, although a more complete study of the work performed by the atmosphere must precede a final verdict on the origin of that formation.

GENERAL.

Old Geographical Documents in Switzerland.—A recent visit to some of the most important Swiss libraries and museums, undertaken by M. Gabriel Marcel during a mission from the French Minister of Foreign Affairs, has led to the discovery of some interesting geographical documents of which the existence was not generally known. These are briefly described by M. Marcel in the first number of the *Bulletin* of the Paris Geographical Society for the present year. The State Museum at Zurich was first visited, and here M. Marcel was struck by the sight of three globes of unusual size. Two of these proved to be reductions of the great terrestrial globes of Coronelli now in Paris, but the third turned out to offer a greater interest, being apparently quite unique. The stand bears the date 1595, but it is possible that the globe itself is earlier. An examination showed a surprising resemblance to the well-known map of the world brought out by Mercator in 1569, and a detailed comparison of the legends showed their almost absolute identity with those of Mercator's map. Of the history of the globe, which has never before been described, nothing seems to be known, and it is impossible to decide whether it was the work of Mercator himself (possibly finished by his son Rumold) or merely a copy, on a spherical projection, of his planisphere. Another interesting discovery at Zurich was that of an atlas, of date 1321, by Perinus (not Petrus) Vesconte of Venice. It contains five sheets delineating the coasts of Europe and of neighbouring parts of Asia and Africa, and is perhaps the only atlas of the thirteenth century which has come down to us in such a complete state. Especially interesting is the evidence supplied by the leathern loops attached, that such atlases were constantly carried about with them by the pilots of those days. At Basle the discovery was made of a copy, in perfect preservation, of Mercator's 1569 planisphere above alluded to, only two copies—in far inferior condition—having been previously known to exist. The atlas in which this map is folded contains also, among other important documents, Mercator's great map of Europe—not the 1554 edition, of which the only known copy was found at Breslau in 1891—but the second edition of 1572, of which no copy had been known to exist. At Basle was found also an apparently unknown cordiform map by Ortelius dated 1564, together with a reduction of the same published by De Judaeis in 1571, a date subsequent to that of the latest hitherto known cordiform maps. M. Marcel concludes with the description of three silver drinking-goblets in the form of globes opening at the equator, which are preserved in the Historical Museum at Basle, and of another of the same class to be found at the Zurich museum. This last was the work of Abraham Gessner (1552–1614), and dates evidently from the last quarter of the sixteenth century. It bears some features characteristic of the cordiform maps of Finaeus and Mercator. Photographic representations of this, and of the Zurich globe above described, accompany the paper.

Erratum.—In the *Journal* for July, p. 34, line 3 from top, for *Bucholleia coriacea* read *Buddleia coriacea*.

OBITUARY.

Sir William Flower, K.C.B., F.R.S.

Sir William Flower, until recently Director of the Natural History Department of the British Museum, died on July 1, after a long period of failing health. He was born at Stratford-on-Avon on November 30, 1831, and served in the Crimean war as an assistant-surgeon. In 1861 he was appointed Curator of the Hunterian Museum of the Royal College of Surgeons, and in 1884 he became Director of the Natural History Museum. While his work lay largely in the direction of research in comparative anatomy and in the organization of museums, he took a keen and growing interest in anthropology—he was President of the Anthropological Institute—and geographical distribution. In 1889 he became a Fellow of the Royal Geographical Society, and was a frequent speaker at the meetings of the Society. Under his directorship the Natural History Museum did much to encourage scientific studies on the part of travellers in remote countries, and he was always ready to co-operate in the organization of expeditions and in working up the collections brought home by explorers. He also did all in his power to encourage the assistants in the Museum to undertake scientific journeys, and geographical science has been not a little advanced by the studies of Mr. George Murray in the West Indies, Dr. J. W. Gregory in East Africa, Mr. C. W. Andrews in Christmas Island, and others in different parts of the world. By his liberal views of the position of a great museum as an incentive to research as well as a place for study, Sir William Flower helped to place geography in its proper position with respect to the other sciences. On the last occasion on which he addressed the Society, when speaking of Dr. Donaldson Smith's natural history work in the Lake Rudolf district, he expressed his views on this subject in these words—

"A collection of this kind must not be valued only by the number of new species it contains, but also by the number of specimens of known species in good preservation, with carefully recorded localities and dates, as this makes the collection important from a geographical as well as a zoological point of view. Each animal and plant has a distribution of its own, dependent, no doubt, upon some physical conditions of the Earth's surface, at present most imperfectly known to us. The study of those conditions is part of the geographer's work, and it can only be fully accomplished when the exact range and distribution of all animals and plants has been determined."

Sir Alexander Armstrong, K.C.B., F.R.S.

Sir Alexander Armstrong, born in 1818, was educated at Trinity College, Dublin, and studied medicine at the University of Edinburgh. He entered the Royal Navy as a surgeon in 1842, and saw a great deal of service in all parts of the world. At the time of his death, on July 4, he had been a Fellow of the Royal Geographical Society for forty-two years. When the expedition to search for Sir John Franklin from the Bering strait eastward was equipped in 1849, Armstrong was appointed surgeon and naturalist to H.M.S. *Investigator*, under the command of Sir Robert McClure. The incidents of this memorable voyage by which the North-West Passage was accomplished for the first and last time are too well known to require repetition. The *Investigator*, leaving her consort the *Enterprise*, pushed on eastwards along the American coast, and was finally blocked in the beginning of the second winter, September, 1851, in Mercy bay on Banks island, where the party remained two winters, until relieved on April 6, 1853,

by Lieut. Bedford Pim, of H.M.S. *Resolute*, Captain Kellett. Another winter was passed in the ice on board the *Resolute*; and finally, after four successive arctic winters, the officers and crew of the *Investigator* were transferred to the *North Star*, and returned to England in September, 1854. Sir Alexander Armstrong took special pains to preserve the crew from scurvy by the liberal administration of lime-juice, and succeeded in staving off the appearance of that disease—then an inevitable accompaniment of arctic travel—until the spring of 1852. This is said to be the longest period that a ship's company had remained free from scurvy during an arctic voyage up to that time.

The outbreak of the Russian war called Sir Alexander Armstrong to service with the Baltic fleet, when he was present at the bombardment of Sveaborg. He subsequently filled the highest offices in the naval medical services, becoming Director-General in 1869, and retiring in 1880. He received the order of K.C.B. in 1871.

In 1857 he published an account of his arctic experiences under the title of 'A Personal Narrative of the Discovery of the North-West Passage,' and in the same year he became a Fellow of the Royal Geographical Society. He was also the author of 'Observations on Naval Hygiene, particularly in connection with Polar Service.'

Franz Ritter von Hauer.

On March 20 last the death occurred of Franz Ritter von Hauer, the predecessor of von Steeb as president of the Vienna Geographical Society, and the successor of von Hochstetter as Director of the Imperial Museum of Natural History in that city. The son of a high state functionary in Vienna, where he was born, in 1822, von Hauer received his technical training at the Mining School at Schemnitz and at Eisenerz, becoming in 1846 assistant in the Museum of Mines at Vienna. He soon took a place in select scientific circles, being one of the original corresponding members of the Vi Academy of Sciences on its foundation in 1848. After travelling at the cos of the academy through Germany, France, England, and the Austrian Crown l nds, he in 1849 took part in the foundation of the Imperial Institute of Geology, to which he was appointed consulting geologist. He likewise took an active share in the foundation of various scientific societies, more or less connected with geography, among them being the Austrian Alpine Club and the Vienna Geographical Society. Of the latter he became Vice-President in 1886, President in 1889, and Honorary President in 1897. In 1866, von Hauer succeeded Haidinger as Director of the Geological Institute, and in 1885, Director of the Natural History Museum. His special researches were not closely connected with geography, being devoted chiefly to the geological history of the Cephalopods; but his studies in this direction brought him in contact with the great Austrian geographer Simony, whose collection of fossils from the Salzkammergut supplied the materials for his first work. Of direct value to geographers was, however, his comprehensive work on the Geology of the Austro-Hungarian Monarchy, of which the first edition appeared in 1875, the second in 1878; and no less so his geological map of the monarchy in twelve sheets, which appeared during the years 1867–71. Articles also appeared from his pen of a strictly geographical nature, as, *e.g.*, that on determinations of heights in Austria and Siebenburgen, and those on the caverns of the Karst and other districts. It may also be mentioned that the introductory volume of the Crown Prince's work on the Austro-Hungarian Monarchy was from the pen of von Hauer.

CORRESPONDENCE.

Dr. Steffen's Exploration in South America.

THIS *Journal* published in its Monthly Record of last June (vol. xiii. p. 663) and July (vol. xiv. p. 96) some notes on Dr. Steffen's latest expedition in the west coast of Patagonia, which require some explanation.

In the first record it states, according to *Petermanns Mitteilungen*, that during his expedition Dr. Steffen noted as flowing into the "Baker channel," three large rivers, the largest of which, flowing from the east in a north-easterly direction, and "supposed to issue from a lake, probably Lake Cochrane," received the name of Rio Baker; the second, coming from the east, that of Rio Bravo; and the third one, entering the south-eastern arm of the channel, which Dr. Steffen thinks may be the lower course of the river Mayer, discovered by Mr. Hatcher, was named Rio de la Pascua.

In the July number it is stated, according to *Globus*, that Dr. Steffen has ascended the river Baker for some 45 miles, and then, leaving the main stream, which flows from the north, reached Lake Cochrane by a tributary from the north-east, and that the "river Baker is one of the largest streams of Chile, having probably the greatest volume," Lake Buenos-Aires belonging to its system.

In the course of my paper before the Royal Geographical Society on May 29, I made reference to Calen inlet, river Las Heras, river Colihue, and to Lakes Pueyrredon and Buenos-Aires; I also showed photographic slides of that inlet, the rivers, and lakes, and in the small sketch-map distributed during the lecture these names may be seen. Moreover, in the general maps presented last January to the Foreign Office by the Argentine Government to illustrate the differences existing between the Argentine and the Chilian experts on the boundary demarcation, and submitted to the arbitration of Her Majesty's Government, these and other geographical features of Patagonia are represented, while they are not on the Chilian maps. In February last I delivered to the Royal Geographical Society general and detailed maps of Patagonia, which may be used in publishing the one to illustrate my lecture, and these maps contain the same features and the names given to them.

I prepared that part of the maps from the results of the investigations of my assistants and myself during the exploration made of the eastern slope of the Cordillera of the Andes, and of some of the fjords of the western slopes in 1897 and the first months of 1898. Dr. Steffen has given the name of "Baker channel" to Calen inlet, the largest transversal fjord of Western Patagonia which figured in the map of Padre Josef Garcia, who visited its entrance in December, 1766, and was again partly explored some years ago by the Chilian steamer *Toro*, when the second and third rivers were noticed but not named, and by the Argentine steamers *Azopardo* and *Golondrina* in December, 1897, under my direction, when we discovered a large river, to which I gave the name of Las Heras (river Baker of Dr. Steffen); explored in part, river Colihue (that is to say, river Bravo of Dr. Steffen), and the river Toro (river de la Pascua of Dr. Steffen), named by me after the Chilian ship that preceded us, and which is the outlet of Lake San Martin, and not the river Mayer, which flows into the same lake. We also discovered at the same time that the inlet is divided into two parts, forming two large islands amongst other smaller ones, the first two receiving the names of *Azopardo* and *Hercules*; while another large island, somewhat further south, is named *Golondrina* island in my map. Surely Dr. Steffen saw our encampments in the inlet, in the rivers, and in Lake Pueyrredon. River Las Heras overflows from Lake Soler, which receives the waters of Lake Buenos-Aires.

The name of Lake Cochrane was given to Lake Pueyrredon by Chilian explorers posteriorly to its discovery and survey by my assistants. River Las Heras (river Baker of Dr. Steffen) is not a Chilian river in its entire extension; it cuts the Cordillera of the Andes.

I think it necessary to make these explanations to avoid confusion in the geography of Patagonia.

FRANCISCO P. MORENO.

The Ancient Ophir.

Grahamstown, Cape Colony, May 1, 1899.

I have read with much pleasure the excellent article by Dr. Schlichter on his Rhodesian explorations. As one of the old members of the Royal Geographical Society, it gives me great satisfaction to see our *Journal* the medium of conveying satisfactory information upon that difficult problem, "Where was the Ophir of King Solomon?" Under an arrangement with the B.S.A. Company and Mr. Rhodes, I proceeded to search the principal libraries of Europe in 1895, and found a key to the study of the archæology of South-Eastern Africa in the Phœnician ruins of Sardinia. My book, entitled, 'Monomotapa (Rhodesia): Its Monuments and its History, from the most Ancient Times to the Present Century,' draws exactly the same conclusions as those arrived at by Dr. Schlichter. There is only one point in which my researches force me to differ from that gentleman. There was certainly an Ophir in South-Eastern Africa, but there was also another on the Malabar coast of India. As in the northern hemisphere there were two "Tarshishes," so in the southern hemisphere there were two Ophirs. This theory reconciles seeming contradictions, and is most reasonable, as merely a rich country is signified by the name. The question is fully treated in the work just quoted, and in it is published an ancient map of South-East Africa, which the authorities of the Vatican allowed me to photograph there.

A. WILMOT.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1898–1899.

Twelfth Ordinary Meeting, June 19, 1899.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*George Beetham; W. M. Coldstream, R.E.; Cortlandt D. Godfrey; R. Gordon-Smith; W. St. C. Muscroft* (*1st Regiment Central India Horse*); *Richard Ellis Potter; William Redshaw, B.A.; Robert Taylor, M.A.*

The Paper read was:—

"Exploration between Lake Rudolf and the Nile." By Colonel J. R. L. Macdonald, R.E.

Thirteenth Ordinary Meeting, June 26, 1899.—General Sir CHARLES W. WILSON, R.E., K.C.B., K.C.M.G., Vice-President, in the Chair.

The Paper read was:—

"Road-Making and Surveying in British East Africa." By Captain G. E. Smith, R.E.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskad.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *Sitzb. A.W. Berlin* (1899): 27–41. **Salomon.**
Neue Beobachtungen aus den Gebieten des Adamello und des St. Gotthard. Von Dr. W. Salomon. *With Sketch-maps.*

Alps—Historical. **Freshfield.**
Hannibal's Pass. By Douglas W. Freshfield. From the *Geographical Journal* for May, 1899. Size 10 × 6½, pp. 6.

Austria—Carniola. *M.k. u. k. Militär-G. I.* 18, 1898 (1899): 64–72. **Gregor.**
Trigonometrische Höhenbestimmung des Punktes Uranschitz (Raßica) im Erdbebengebiete von Laibach. Von Julius Gregor. *With Map.*
On the resurvey of the Laibach region in order to ascertain whether the earthquake of 1895 had produced any noticeable changes; the result is to show that no such disturbance had resulted.

Austria—Salzburg. *Speluncа* 4 (1898): 107–109. **Függer.**
Le "Nixloch" du Wildmoos près Fuschl (Salzburg, Autriche). Par M. le Professeur Eb. Függer.

Austria—Speleology. *Globus* 75 (1899): 313–318, 333–335. **Crammer and Sieger.**
Untersuchungen in den Ötscherhöhlen. Von Prof. Hans Crammer u. Prof. Dr. Rob. Sieger.
On the exploration of the caves of the Oetschberg.

Austria—Styria. *Speluncа* 4 (1898): 98–106. **Hérèus.**
La Caverne de Ratelstein en Styrie. Par C. G. Hérèus (1720).
The description from an old manuscript of an early exploration of one of the caves of Styria.

Austria—Tirol. *Abh. G. Ges. Wien* 1 (1899): 77–89. **Damian.**
Seestudien. Lago di Serrais, Lago delle Piazze, Prager Wildsee und Antholzer See. Von Josef Damian. *With Maps.*

Austria—Tirol. *Globus* 75 (1899): 383–384. **Jaeger.**
Das Innthal bei Kufstein und die Eiszeit. Von Julius Jaeger.

Austria-Hungary. *M. k. u. k. Militär-G. I.* 18, 1898 (1899): 41–63. **Sterneck.**
Das neue Dreiecksnetz 1. Ordnung der österreichisch-ungarischen Monarchie. Von Robert v. Sterneck. *With Map.*

Austria-Hungary—Surveys. *M. k. u. k. Militär-G. I.* **18**, 1898 (1899): 80–92. **Steeb.**

Die neueren Arbeiten der Mappierungs-Gruppe. Von Christian Ritter v. Steeb. *With Maps.*

France. **Berthaut.**

Service Géographique de l'Armée. La Carte de France, 1750–1898. Étude historique par le Colonel Berthaut. 2 vols. Paris. Imprimerie du Service Géographique, 1898-1899. Size 11 × 9, pp. (vol. i.) xviii. and 342; (vol. ii.) 586. *Maps and Plates. Presented by the French Minister of War.*

France. *Spelunca* **4** (1898): 12–17. **Galimard.**

Les Caveaux de Verpant, Commune de Flavigny (Côte d'Or). Résultat des fouilles. Par M. Joseph Galimard. *With Illustrations.*

France. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **16** (1899): 37–42. **Kuyper.**

Frankrijk en zijne landschappen. Door J. Kuyper.

A table giving the old provinces of France in alphabetic order, with the capital, the departments into which they are now divided and their capitals, and the natural districts, the names of which very frequently are expressive of geographical characteristics.

France. *B.S.G. Genève* **38** (1899): 25–39. **Lugeon.**

L'origine du Chablais. Par M. Maurice Lugeon.

On the geological structure of the Alps in the Chablais, the summary of a comprehensive research.

France. *Spelunca* **4** (1898): 24–31. **Marcelin.**

La grotte de Magagnosc (Alpes Maritimes). Par M. Chiris Marcelin. *With Plan and Illustrations.*

France—Languedoc. *B.S. Languedoc G.* **21** (1898): 435–458. **Fondouce.**

Contribution à une faune historique du Bas Languedoc. Par Cazalis de Fondouce.

France—Lunéville. *B. Trim. S.G. de l'Est* (1898): 409–437. **Andriot.**

Répartition de la population dans l'arrondissement de Lunéville, d'après le relief, la nature du sol, les cultures, les industries. Par M. E. Andriot. *With Map.*

France—Marseilles.

Congrès National des Sociétés Françaises de Géographie. XIX^e^, Session—1898—Marseille. Études sur Marseille et la Provence. Appendice: La Société de Géographie de Marseille (Histoire de la Société et Table du Bulletin), 1876–1898. Marseille, 1898. Size 10 × 6½, pp. 130 and 70. *Maps, Plans, and Illustrations.*

France—Mont Blanc. **Duparc and Mrazec.**

Mém. S. Phys. et d'Histoire Nat. Genève **33** (1898): 1–228.

Recherches géologiques et pétrographiques sur le massif du Mont-Blanc. Par Louis Duparc et Ludovic Mrazec. *With Plates.*

France and Italy. *B. Union G. Nord de la France* **19** (1898): 289–295. **Thury.**

Projet de jonction géodésique entre la France et l'Italie. Par Cassini de Thury, en 1776.

Germany—Baden. **Uhlig.**

Die Veränderungen der Volksdichte im nördlichen Baden 1852–1895. Von Dr. Carl Uhlig.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Elfter Band. Heft 4. Stuttgart: J. Engelhorn, 1899. Size 9½ × 6½, pp. 107–228. *Maps.*

On the changes in the distribution of population in Northern Baden between 1852 and 1895. A map of the density of population is given for each of the two years named, and a third map showing the relative increase or diminution of density.

Germany—Northern Plain. *Verh. Ges. Erdk. Berlin* **26** (1899): 129–139. **Keilhack.**

Herr Dr. Keilhack: Thal- und Seebildung im Gebiet des Baltischen Höhenrückens. *With Map.*

On the ancient valley and lake systems of Northern Germany, and a consideration of the causes which led to their origin and extinction.

Germany—Prussia. **Zweck.**

Litauen, eine Landes- und Volkskunde. Von Dr. Albert Zweck. (Deutsches Land und Leben in Einzelschilderungen. Landschaftskunden und Städtegeschichten.

I. Landschaftskunden.) Stuttgart: Hobbing & Büchle, 1898. Size 8½ × 6, pp. viii. and 452. *Maps and Illustrations. Price* 8*s.*

A physical and anthropogeographical description of the north-eastern portion of Prussia.

Germany—Rhine Province. *Deutsche Rundschau G.* **21** (1899): 306–309. **Mehlis.**

Glaciale Erscheinungen vom Hartgebirge. Von Prof. Dr. C. Mehlis.

Germany—Schleswig. *Petermanns M.* **45** (1899): 37–40. **Langhans.**

Deutsche und Dänen in Nordschleswig. Von Paul Langhans. *With Map.*

A study of the distribution of the German and Danish languages in Schleswig at different periods since the annexation of the province.

Greece. **Leonhard.**

Die Insel Kythera. Eine geographische Monographie. Von Dr. Richard Leonhard. —Dr. A. Petermann's Mitteilungen. Ergänzungsheft Nr. 128. Gotha: J. Perthes, 1899. Size 11 × 7½, pp. 48. *Map.*

Hungary. *Mém. S. Spéléologie* **3** (No. 16) (1898): 1–20. **Siegmeth.**

Notes sur les Cavernes de Hongrie. Par M. Charles Siegmeth. *With Plans and Illustrations.*

Hungary—Towns. *Abrégé B.S. Hongroise G.* **26** (1898): 42–50. **Thirring.**

Die Bevölkerungsverhältnisse der ungarischen Städte im Jahre 1777. Von Dr. Gustav Thirring.

Italian Alps—Glaciers. *Mem. S.G. Italiana* **8** (1898): 155–174. **Marson.**

Sui ghiacciai del Massiccio del M. Disgrazia o Pizzo Bello. Osservazioni del 1897. Nota del socio Prof. Luigi Marson. *With Map and Illustrations.*

Italian Alps—Glaciers. *Mem. S.G. Italiana* **8** (1898): 175–198. **Marson.**

Sui ghiacciai italiani del Bernina proprio. Prime Osservazioni del 1897. Nota del socio professore Luigi Marson. *With Map and Illustrations.*

Italian Alps—Glaciers. *Riv. G. Italiana* **6** (1899): 94–97. **Marinelli.**

Lo studio del movimento dei ghiacciai in Italia nel 1898. Rapporto annuale II. di G. Marinelli.

Italy—Meteorology. *Riv. G. Italiana* **6** (1899): 201–211. **Saija.**

Deviazioni delle medie meteorologiche mensili normali dalla corrispondente media annua in Italia. Nota di G. Saija.

Italy—Venice. *Riv. G. Italiana* **6** (1899): 98–104. **Bertolini.**

Ancora della Linea e dei Fiumi di Resorgiva in relazione alle lagune e al territorio Veneto del Prof. G. L. Bertolini.

Italy—Vesuvius. *Alpine J.* **19** (1899): 437–440. **Anderson.**

Vesuvius: a Note on the Eruption of September, 1898. By Tempest Anderson, M.D. *With Illustrations.*

Mediterranean—Crete. ———

Turkey, No. 1 (1899). Further Correspondence respecting the Affairs of Crete. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. xiv. and 152. *Plan. Price* 1*s.* 5½*d.*

Netherlands. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **16** (1899): 143–177. **Lorié.**

Het Brongas in Nederland. Door J. Lorié.

On springs of natural gas in Holland.

Netherlands—Language. **Winkel.**

Tijds. K. Ned. Aard. Genootschap **16** (1899): No. 1 Supplement, 49–124.

De Noordnederlandsche tongvallen. I. De Germaansche lange Æ of Nederlandsche lange A. Door Dr. J. te Winkel. *With Map.*

On the distribution of the pronunciation of certain vowel sounds in Holland.

Norway. *Z. Ges. Erdk. Berlin* **33** (1898): 367–392. **Magnus.**

Zur Siedelungskunde von Norwegen. Von Dr. Phil. Hagbart Magnus. *With Maps.*

Norway. *Alpine J.* **19** (1899): 414–437. **Slingsby.**

Mountaineering in Arctic Norway. By William Cecil Slingsby. *With Illustrations.*

Russia—Meteorology. ———

Observations faites à l'observatoire météorologique de l'Université Impériale de Moscou. July—December, 1896, with Annual Summary; 1897, and Annual Summary, January—November, 1898. Size 11 × 8.

Scandinavia. **Baedeker.**

Norway, Sweden, and Denmark. Handbook for Travellers. By Karl Baedeker. With 32 Maps, 21 Plans, and three small Panoramas. Seventh Edition. Leipsic: K. Baedeker, 1899. Size 6½ × 4½, pp. lxxx., 461, and 40. *Price* 10 *marks. Two Copies. One Presented by the Publisher, the other by Messrs. Dulau & Co.*

Southern Europe. **Nerad.**

Vztah poloostrova Apenninského ku Balkánskému po stránce geografie fysikálné. Srovnává F. Nerad. V Uh. Brodě, 1898. Size 10 × 6½, pp. 42. *Presented by the Author.*

A comparison of the physical geography of the Italian and the Balkan peninsulas.

Switzerland. *B. Union G. Nord de la France* **19** (1898): 217-226. **Maquet.**

L'Engadine, le Massif de la Bernina. Par M. Maquet.

Switzerland—People. *B.S.G. Genève* **38** (1899): 57-76. **Pitard.**

Contribution à l'ethnographie du Valais. Par M. Eugène Pitard.

Switzerland—Rainfall. *B.S.G. Genève* **38** (1899): 52-57. **Gautier.**

La pluie en Suisse et à Genève. Par M. Raoul Gautier.

Turkey. *Deutsche Rundschau G.* **21** (1899): 295-302. **Struck.**

Wodena. Von Adolf Struck. *With Illustrations.*

United Kingdom—England. *J.R. Agricultural S.* **10** (1899): 30-86. **Bear.**

Flower and Fruit Farming in England. III. Fruit Growing in the Open. By William E. Bear.

United Kingdom—Meteorology. ———

Meteorological observations at Stations of the Second Order for the year 1895. Edinburgh: Printed for Her Majesty's Stationery Office. London: Eyre & Spottiswoode, 1899. Size 12½ × 10, pp. 184. *Map. Price* 22*s.* 6*d. Presented by the Meteorological Office.*

United Kingdom—St. Kilda. **Kearton.**

With Nature and a Camera, being the Adventures and Observations of a Field Naturalist and an Animal Photographer. By Richard Kearton. Illustrated by 180 Pictures from Photographs by Cherry Kearton. London: Cassell & Co., 1898. Size 9½ × 6½, pp. xvi. and 368.

This book contains some chapters on St. Kilda.

United Kingdom—Scotland. *Geolog. Mag.* **6** (1899): 196-199. **Harker.**

Glaciated valleys in the Cuillins, Skye. By Alfred Harker.

United Kingdom—Yorkshire. *Spelunca* **4** (1898): 31-39. ———

La descente de Rowten-Pot (Yorkshire, Angleterre). *With Plans and Illustrations.*

ASIA.

Arabia. **Landberg.**

Die Expedition nach Süd-Arabien. Bericht an die kaiserliche Akademie der Wissenschaften in Wien. Von Dr. C. Graf Landberg. (2 parts.) Size 9 × 6, pp. 186. *Presented by the Author.*

Dr. Müller's description of the Austrian expédition to Southern Arabia appeared in the *Journal* for June (vol. xiii. p. 638); this is Count Landberg's report of his dealings with the native sultans and his grievances against Dr. Müller. An English translation is promised to be published in London at an early date.

Arabia—Yemen. *B.S.R.G. d'Anvers* **23** (1899): 79-97. **Charnay.**

Une excursion au Yémen. Par M. Désiré Charnay.

Armenia. *Sitz. A.W. Berlin* (1899): 116-120. **Belck and Lehmann.**

Bericht über eine Forschungsreise durch Armenien. Von W. Belck und C. F. Lehmann.

Asia—British and French Possessions. **Wagner.**

Petermanns M. 45 (1899): 147–150.

Die Grösse der britischen und französischen Besitzungen in Vorder- und Hinterindien. Von Hermann Wagner. *With Map.*

Central Asia. **Hedin.**

Durch Asiens Wüsten. Drei Jahre auf neuen Wegen in Pamir, Lop-nor, Tibet und China. Von Sven Hedin. 2 vols. Leipzig: F. A. Brockhaus, 1899. Size 9½ × 6½, pp. (vol. i.) xx. and 512; (vol. ii.) x. and 496. *Maps, Portrait, and Illustrations. Two copies, one presented by the Publisher, the other by Messrs. Methuen & Co.*

The German version of Dr. Hedin's 'Through Asia' is very handsomely printed and bound in coloured boards of a striking Oriental design. The contents are practically identical with those of the English translation of the great trans-Asian journey.

Central Asia and Tibet. **Dutreuil de Rhins.**

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Greenland. *G.Z.* **5** (1899): 261–279. **Drygalski.**

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MATHEMATICAL GEOGRAPHY.

Cartography—Paper. *M. k. u. k. Militär-G. I.* **18**, 1898 (1899): 160–168. **Hübl.**

Beiträge zur Technik der Kartenerzeugung. Von Arthur Freiherrn von Hübl. III. Die Wahl des Druckpapieres.

On the choice of paper for printing maps, with specimens of various qualities.

Geodesy. *Vierteljahrsb. Naturforsch. Ges. Zürich* **43** (1898): 340–353. **Rudio.**

Ueber die Principien der Variationsrechnung und die geodätischen Linien des *n*-dimensionalen Rotationsellipsoides. Von Ferdinand Rudio.

Geodetic Instruments. *M. k. u. k. Militär-G. I.* **18**, 1898 (1899): 73–79. **Truck.**

Der Jäderin'sche Basis—Messapparat. Mit Benützung russischer Quellen dargestellt von Sigismund Truck.

Description of Jäderin's measuring instrument for base-lines. It consists of a wire measuring-line strained to a constant tension as indicated by a dynamometer, and provided with graduated brass tubes at the ends for obtaining exact readings.

Gravity. *Abh. A.W. Berlin* (1898): 1–196. **Richarz and Krigar-Menzel.**

Bestimmung der Gravitationsconstante und der mittleren Dichtigkeit der Erde durch Wägungen. Von F. Richarz und O. Krigar-Menzel. *With plates.*

Nautical Almanac.

The Nautical Almanac and Astronomical Ephemeris for the year 1902. Also Part i. (containing such portions as are essential for Navigation). Published by order of the Lords Commissioners of the Admiralty, Edinburgh: Printed for Her Majesty's Stationery Office; London: Eyre & Spottiswoode. Size 9½ × 6, pp. xiv. and 638; (Part i.) xiv. and 312. *Price* 2*s.* 6*d.*; *Part I.*, 1*s.* *Presented by the Admiralty.*

Sea-routes. *C. Rd., S.G. Paris* (1899): 105–108. **Serre.**

Comparaison des deux routes d'Europe à San Francisco par le cap Horn et par le cap de Bonne-Espérance. [Par M. Paul Serre.]

The sailing ship *Cape Clear* made the voyage from Hamburg to San Francisco last year in 152 days by the Cape of Good Hope, the favourable prevailing wind enabling it to average over 9 knots for nearly two consecutive months. Although the route is 24,296 nautical miles as compared with 14,000 miles by Cape Horn, the contrary winds on the latter passage often prolong the voyage to 150 days, and a good passage occupies 120.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Coast-forms. *J. Geology* **7** (1899): 237–246. **Jefferson.**

Beach Cusps. By Mark S. W. Jefferson. *With Illustrations.*

Earthquake Waves. **Russell.**

The Source of the Periodic Waves which are recorded from time to time on the Sydney and Newcastle Tide-Gauges. By H. C. Russell. [1898.] Size 9 × 6, pp. 6. *Presented by the Author.*

Geophysics. *Rep. Smithsonian I.* 1897 (1898): 337–357. **Kelvin.**

The Age of the Earth as an Abode fitted for Life. By the Right Hon. Lord Kelvin.

Glacier-study. *Abh. G. Ges. Wien* **1** (1899): 1–13. **Richter.**

Neue Ergebnisse und Probleme der Gletscher-Forschung. Von Dr. Eduard Richter.

This paper is the first to appear in the new large-page publication of the Vienna Geographical Society, in which original memoirs will hereafter be published, the smaller *Mitteilungen* being reserved for the proceedings of the Society, notes, bibliography, etc.

Land and Sea Hemispheres. *G.Z.* **5** (1899): 121–126. **Penck.**

Die Pole der Landoberfläche. Von Albrecht Penck.

A critical examination of Dr. Beythien's paper (see *Journal*, vol. xiii. p. 541), in which Prof. Penck concludes that no one point can be accepted as an exact centre of the land-hemisphere, but that two poles may be assumed: one in Brittany, which brings Japan into the land-hemisphere, the other in the Eastern Pyrenees, which leaves Japan in the sea-hemisphere.

Magnetic Instruments. **Palazzo.**

Atti R.A. Lincei, Rendiconti **8** (1899): 386–392; 443–447.

Confronti degli strumenti magnetici italiani con quelli degli osservatori di Parc Saint-Maur e di Kew. Nota di Luigi Palazzo.

Meteorology. **Hepworth.**

The value of Meteorological Observations at Sea, and some hints upon observing. By M. W. Campbell Hepworth.—Shipmasters' Society, London. [Course of Papers, No. 62.] London, 1899. Size 8½ × 5½, pp. 85–114.

Meteorology—Cyclones. *Ann. Hydrographie* **27** (1899): 183–190. **Knipping.**

Ueber den Genauigkeitsgrad der Bahn-bestimmung stark ausgeprägter barometrischer Minima nach den Beobachtungen eines Schiffes in See. Von E. Knipping. *With diagrams.*

On the exact determination of the path of a cyclone from observations on board a ship at sea.

Meteorology—Lightning. *Sitzb. A.W. Berlin* (1899): 291–300. **Bezold.**

Ueber die Zunahme der Blitzgefahr während der letzten sechzig Jahre. Von Wilhelm von Bezold.

Meteorology—Pressure. *Quarterly J.R. Meteorolog. S.* **25** (1899): 32–40. **Dines.**

The Connection between the Winter Temperature and the Height of the Barometer in North-Western Europe. By W. H. Dines. *With Diagrams.*

Meteorology—Temperature. *Meteorolog. Z.* **16** (1899): 157–161. **Edvi.**

Die Lage der Isotherme von 0° C. Von Edm. Illés v. Edvi, jun.

A mathematical investigation of the vertical distribution of temperature in the air.

Meteorology—Wind. **Dines and Wilson-Barker.**

Quarterly J.R. Meteorolog. S. **25** (1899): 1–13.

Report on Experiments upon the exposure of Anemometers at different elevations. By the Wind Force Committee. Drawn up by W. H. Dines, B.A., and Captain D Wilson-Barker. *With Map.*

Meteorology—Wind. *Quarterly J.R. Meteorolog S.* **25** (1899): 13–19. **Wilson-Barker.**

Comparison of Estimated Wind-Force with that given by Instruments. By Captain D. Wilson-Barker.

Oceanographical Apparatus. *Sci. P.R. Dublin S.* **8** (1898): 509–514. **Joly.**

On the Geological Investigation of Submarine Rocks. By J. Joly, M.A. *With Plate.*

Prof. Joly describes a form of electric drill which he has designed for the purpose of boring out cores of rock from the sea-bed at great depths. The apparatus has not been tested.

Oceanographical Apparatus. *Sci. P.R. Dublin S.* **8** (1898): 753–755. **O'Toole.**

An Improved Form of Hydrometer, by which the Specific Gravity of Liquids may be accurately determined at any Temperature. By the Rev. H. O'Toole.

A form of hydrometer which escapes the error due to capillarity.

Oceanography.

Berichte der Commission für oceanographische Forschungen. Collectiv-Ausgabe aus dem LXV. Bande der Denkschriften der Kaiserlichen Akademie der Wissenschaften. A. Forschungen im Rothen Meere. B. Forschungen im östlichen Mittelmeere. Wien, 1898. Size 12 × 9½, pp. vi. and 628. *Maps and Plates.*

This collective volume contains the reports of the work done in the Red Sea in 1895–96, including gravity, magnetic, meteorological, geodetic, physical, zoological, and chemical observations and researches by various specialists. Five sections are also devoted to part of the zoological results of the cruise in the Eastern Mediterranean in 1889–94.

Physical Geography. **Klein.**

Jahrbuch der Astronomie und Geophysik. Enthaltend die wichtigsten Fortschritte auf den Gebieten der Astrophysik, Meteorologie und physikalischen Erdkunde . . . herausgegeben von Dr. Hermann J. Klein. IX. Jahrgang 1898. Leipzig: E. H. Mayer, 1899. Size 9 × 6, pp. viii. and 384. *Map and Plates.*

Physical Geography. **Rouville.**

B.S. Languedoc. G. **21** (1898): 173–194, 324–342, 482–504.

Une leçon familière d'anatomie du globe terrestre. Par P. G. de Rouville.

Phyto-Geography. *G.Z.* **5** (1899): 142–162. **Karsten.**

Pflanzengeographie auf physiologischer Grundlage nach Dr. A. F. W. Schimper. Von G. Karsten. *With Illustrations.*

Terrestrial Magnetism. *Terrestrial Magnetism* **4** (1899): 33–52. **Bauer.**

The Physical Decomposition of the Earth's Permanent Magnetic Field—No. 1. The Assumed Normal Magnetization and the characteristics of the Resulting Residual Field. By L. A. Bauer. *With Diagrams.*

Terrestrial Magnetism. *Terrestrial Magnetism* **4** (1899): 53–58. **Bauer.**

Is the Principal Source of the Secular Variation of the Earth's Magnetism within or without the Earth's Crust? By L. A. Bauer. *With Diagrams.*

Terrestrial Magnetism. *Terrestrial Magnetism* **4** (1899): 7–14. **Hayford.**

Is there a 428-Day Period in Terrestrial Magnetism? By John F. Hayford.

Wind-formed Deposits. **Udden.**

Augustana Library Publications. Number 1. The Mechanical Composition of Wind Deposits. By Johan August Udden. Rock Island, I.U., 1898. Size 11 × 8, pp. 70.

A study of the forms and fineness of the particles in gravels, dune-sand, and dust deposited or transported by atmospheric action.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology. **Giglioli.**

Due singolarissime e rare Trombe da Guerra guernite di ossa umane dell' Africa e dell' America meridionale. Nota del Prof. Enrico H. Giglioli. (Estratto dall' *Archivio per l'Antropologia e l'Etnologia*, vol. xxvi. Fasc. 2°—1896.) Size 10 × 7, pp. 8. *Presented by the Author.*

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La Moneta tra popoli primitivi ed il "Birok," danaro aristocratico della Nuova Irlanda. Nota di Enrico H. Giglioli. (Estratto dall' *Archivio per l'Antropologia e l'Etnologia*, vol. xxvii. Fasc. 3°—1897.) Size 10 × 7, pp. 4. *Presented by the Author.*

Commercial Geography—Maize. *J.R. Agricultural S.* **10** (1899): 116–136. **Dunham.**

Maize and its uses. By Robert W. Dunham.

On the distribution of maize as a farm crop in different countries.

Commercial Geography—Ramie. **Schulte.**

Die Ramiefaser und die wirtschaftliche Bedeutung der Ramiekultur für die deutschen Kolonien. Von A. Schulte im Hofe. Berlin: Deutscher Kolonial-Verlag (G. Meinecke), 1898. Size 9½ × 6½, pp. 50.

Commercial Geography—Shipping. **Huni.**

B.S.G. Com. Bordeaux **22** (1899): 38–42, 140–144.

Les flottes de commerce et le trafic maritime. Par A. Huni.

A comparison of the mercantile marines of different nations.

Commercial Geography—Silk.

Special Consular Reports. Sericulture and Silk Reeling from the Cocoons by Machinery. Cultivation of the English Walnut. Vol. xv., part ii. Washington, 1899. Size 9½ × 6, pp. 127–170. *Illustrations.*

Commercial Geography—Tropical Agriculture. **Lecomte.**

B.S.G. Com. Paris **21** (1899): 17–32.

Influence des jardins d'essai sur le développement de l'agriculture aux colonies. Par M. Henri Lecomte.

Fetishism. *B.S. Neuchateloise G.* **11** (1899): 119–136. **Perregaux.**
Le Fétichisme. Par E. Perregaux.
A study of West African fetishism by a missionary.

Historical. *B.S. Topographie France* 22 (1898): 58–62, 122–126. **Guyot.**
Table de Peutinger. Par M. le capitaine Guyot.

Historical—Ancient Globus. *B.S.G. Paris* **20** (1899): 76–94. **Marcel.**
Note sur une mission géographique en Suisse. Par Gabriel Marcel. *With Illustrations. Also separate copy. Presented by the Author.*

Historical—Cabot. *P. and T.R.S. Canada* **3** (1897): xciii.–clxxvi. ——
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Historical—Cabot. *P. and T.R.S. Canada* **3** (1897): 279–307. **Thacher.**
The Cabotian Discovery. By J. B. Thacher.

Historical—Cabot. *P. and T.R.S. Canada* **3** (1897, Sect II.): 139–268. **Dawson.**
The Voyages of the Cabots. Latest Phases of the Controversy. By Samuel Edward Dawson, LIT. D. (Laval). *Maps.*

Historical—Gilbert. *P. and T.R.S. Canada* **3** (1897): 113–127. **Patterson.**
Termination of Sir Humphrey Gilbert's Expedition. By the Rev. George Patterson, D.D., etc. *With Maps and Illustrations.*
Discusses the probable position of the shipwreck of the *Squirrel* with Sir Humphrey Gilbert on board in 1583, and comes to the conclusion that it was off Louisbourg harbour, and not on Sable island.

Historical—Maps. *Z. Ges. Erdk. Berlin* **33** (1898): 400–417. **Kretschmer.**
Nordenskiöld's Periplus. Von K. Kretschmer.

Historical—Marco Polo. *M.G. Ges. Hamburg* **15** (1899): 45–65. **Schäfer.**
Zur Erinnerung an Marco Polo. Von Dr. Ernst Schäfer.

Historical—Vasco da Gama. *B.S.R.G. d'Anvers* **22** (1899): 307–328. **Ceulemans.**
Les découvertes maritimes des Portugais et le premier voyage de Vasco da Gama aux Indes. Par M. E. Ceulemans.

Historical—Vasco da Gama. **Hümmerich.**
Jahresb. G. Ges. München, 1896 u. 1897 (1898): 49–75.
Vasco da Gama. Von Dr. Franz Hümmerich.

Historical Geography. *Mem. S.G. Italiana* **8** (1898): 224–243. **Ricchieri.**
Di alcuni studi di storia della Geografia antica. Nota del socio Prof. Giuseppe Ricchieri.
Discussion of a number of works on the geographical knowledge of the Greeks.

BIOGRAPHY.

Hauer. *Abh. G. Ges. Wien* **1** (1899): 91–118. **Böhm.**
Zur Erinnerung an Franz von Hauer. Von Dr. August Böhm Edlen von Böhmersheim.

Kiepert. *Globus* **75** (1899): 297–301. ——
Selbstbiographie von Heinrich Kiepert, † 21 April, 1899.
This portion of autobiography was written in 1873 for Dr. Richard Andree. The first page is here given in facsimile of the author's handwriting.

Michelet. *B.S. Topographie France* **23** (1898): 130–134. **Drapeyron.**
Comment Michelet est devenu historien et géographe. Par M. L. Drapeyron.

Partsch. *Deutsche Rundschau G.* **21** (1899): 326–328. ——
Josef Partsch. *With Portrait.*

Patterson. *P. and T. Nova Scotian I. Sci.* **9** (1898): xcv.–xcviii. **Gilpin.**
Obituary Notice of the late Rev. G. Patterson, D.D., LL.D. *With Portrait.*

Péchy. *Abrégé B.S. Hongroise G.* **26** (1898): 1–3. **Homolka.**
Emerich v. Péchy. Von Josef Homolka.
Emerich von Péchy was a Hungarian cartographer, born September 25, 1832, died February 19, 1898.

Pomba. *Deutsche Rundschau G.* **21** (1899): 423–425. ——

Cesare Pomba. *With Portrait.*

Schoeller. *Deutsche Rundschau G.* **21** (1899): 421–423. **Paulitschke.**

Dr. Max Schoeller. Von Ph. Paulitschke. *With Portrait.*

GENERAL.

Africa—Health. **Crosse.**

Blackwater Fever. By W. H. Crosse. Reprinted from the *Lancet*, March 25 and April 1, 1899. Size 7 × 5, pp. 23. *Presented by the Author.*

Bibliography. **Newman.**

University of the State of New York. State Library Bulletin, Bibliography No. 14. August, 1898. Index to Subject Bibliographies in Library Bulletins to December 31, 1897. By Alice Newman. Albany, 1898. Size 10 × 7, pp. 369–426.

Bibliography—Library Catalogue. **Grulich.**

Katalog der Bibliothek der Kaiserlichen Leopoldinisch-Carolinischen Deutschen Akademie der Naturforscher. Bearbeitet von Oscar Grulich. Zweiter Band. Halle, 1893-98. Size 10 × 6½, pp. I. and 1027–1436. *Presented by the Academy.*

A classified subject catalogue, with alphabetical index, now completed.

British Colonies. **Chevilliard.**

Les Colonies Anglaises. Par G. Chevilliard. Paris: A. Challamel, 1899. Size 10 × 6½, pp. 416. *Presented by the Author.*

An account of the British empire from the administrative point of view, laying stress on the difference in the political organization of the various dependencies according to the peculiarities of population and productions.

British Colonies. *J.R. Colonial I.* **30** (1899): 477–520. **Robinson.**

The Colonies and the Century. By Hon. Sir John Robinson, K.C.M.G.

British Empire. ——

The Queen's Empire. A Pictorial and Descriptive Record. Illustrated from Photographs. 2 vols. London: Cassell & Co., 1897–1899. Size 9½ × 12½, pp. (vol. i.) xx. and 288; (vol. ii.) xii. and 288. *Map. Presented by the Publishers.*

A collection of photographs illustrating life in all parts of the British Empire, especially with reference to defence, administration, religion, and sports.

Educational—Pictures. **Dubois and Guy.**

Album Géographique. Par MM. Marcel Dubois et Camille Guy. Tome III. Les régions tempérées. Paris: A. Colin & Cie, 1899. Size 11½ × 9, pp. xx. and 244. *Illustrations. Price* 13*s.* 6*d.*

Educational—Pictures. **Zimmerer**

Jahresb. G. Ges. München, 1896 u. 1897 (1898): 89–98.

Der Photocol-Sammel-Atlas, eine neue Methode des geographischen Anschauungs-Unterrichtes. Von Dr. H. Zimmerer.

Describes Herr Rudolph Mayer's system of coloured photographs of places arranged for education. The method will soon be exemplified in an English edition.

Egyptian Geographical Museum. **Bonola.**

Société Khédiviale de Géographie. Le Musée de Géographie et d'Ethnographie. Notice par le Dr. Frédéric Bonola Bey. Le Caire, 1899. Size 10 × 6½, pp. 30. *Illustrations. Presented by the Société Khédiviale de Géographie.*

Describes the museum of the Khedivial Geographical Society recently opened at Cairo.

Geographical Orthography. **Garnier.**

Méthode de Transcription Rationnelle générale des noms géographiques s'appliquant à toutes les écritures usitées dans le monde. Par Christian Garnier. Paris: E. Leroux, 1899. Size 13 × 10, pp. xii. and 148. *Presented by the Publisher.*

The late M. Garnier devoted much attention to the question of orthography. The transliteration of oriental and slavonic alphabets is here considered in great detail, as well as the phonetic rendering of languages which possess no alphabet.

Geographical Progress. *B.S.G. Paris* **20** (1899): 5–75. **Hulot.**

Rapport sur les progrès de la géographie pendant l'année 1898. Par le baron Hulot. *With Maps.*

Geographical Year-Book. **Wagner.**

Geographisches Jahrbuch. XXI. Band, 1898 . . . herausgegeben von Hermann Wagner. Gotha: Justus Perthes, 1899. Size 8½ × 6, pp. viii. and 500.

This volume contains a statement of the progress of polar research by Dr. Drygalski, of the study of the countries of Europe (except the United Kingdom, Austria-Hungary, and Russia) by Prof. Fischer, of ethnology by Prof. Gerland, and of geographical meteorology by Prof. Brückner.

Geographical Year-Book. **Wagner.**

Geographisches Jahrbuch. XXII. Band, 1899 . . . herausgegeben von Hermann Wagner. Erste Hälfte. Gotha: Justus Perthes, 1899. Size 8½ × 6, pp. 244.

This issue includes a report on the progress of Oceanography in 1897 and 1898, by Prof. Krümmel; a report on the progress of surveying and the astronomical fixing of position, by Dr. Hammers; an account of recent advances in the geological structure of different regions, by Prof. Toula; and a report on recent works respecting the geography of the ancients, by Prof. Eugen Oberhummer.

Geography. *B. American G.S.* **31** (1899): 123–149. **Littlehales.**

The Navy as a Motor in Geographical and Commercial Progress. By G. W. Littlehales. *With Maps.*

Italian Geographers. *Mem. S.G. Italiana* **8** (1898): 295–337. **Bertacchi.**

Geografi italiani all' estero. Memoria del Socio prof. Cosimo Bertacchi.

On the work of Italians in geography in all parts of the world.

List of Maps. **Knox.**

A Guide to Recent Large-scale Maps, including both Surveys and Compilations; together with a list of some large Sheet Atlases, forming a Supplement to 'Notes on the Government Surveys of the Principal Countries of the World' (1882). Prepared in the Intelligence Division, War Office, by Alexander Knox, B.A., Map Curator. London: Eyre & Spottiswoode, 1899. Size 10 × 6½, pp. viii. and 182. *Price 5s. 6d. Presented by the War Office.*

This list gives the name of the map, the scale, date, publisher, and general remarks, including size of sheet and price. It is arranged, for the most part, alphabetically in countries, under the head of each continent.

Moravian Missions.

Periodical Accounts relating to the Foreign Missions of the Church of the United Brethren ("Moravians"). Second Century. Volume iv. London, 1899. Size 8½ × 5½, pp. 60 and xxviii.

Portuguese Colonies. *B.S.G. Marseille* **22** (1898): 117–142. **Barré.**

Les Colonies Portugaises. Par M. Henri Barré.

A summary based on Captain Vasconcello's book on the Portuguese colonies.

Street Traffic. *J. Franklin I.* **147** (1899): 315–327, 344–359. **Higgins.**

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Germany. **Topogr. Bureau des K. Bayer. General-Stabes.**

Karte des Deutschen Reiches. Herausgegeben vom topogr. Bureau des K. Bayer. General-Stabes, 1899. Sheet 673, Vereinsalpe. Scale 1 : 100,000 or 1·6 stat. mile to an inch. *Price* 1.50 *marks.*

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Central Asia. **Grenard.**

Mission Scientifique dans la Haute-Asie. Carte de l'Asie Centrale, dressée d'après les travaux des explorateurs modernes les cartes chinoises et les renseignements d'indigènes par F. Grenard, dessinée par J. Hansen, 1899. Publication du Ministère de l'Instruction Publique Paris. Scale 1 : 4,000,000 or 63 stat. miles to an inch. Ernest Leroux, Paris.

This map is without hill-shading, but is to a certain extent orographically coloured, the mountain regions being tinted brown, and the crests of the ranges being indicated by brown lines of different breadths, according to their relative importance. The routes of explorers are shown, though somewhat indistinctly. The capitals of provinces, prefectures, travellers' rest-houses, and post stations are distinguished by the different symbols employed, and other useful information is given.

Central Asia. **Grenard.**

Carte Ethnographique et Politique de l'Asie Centrale par F. Grenard, 1899. Supplément á l'Atlas de la Mission Dutreuil de Rhins. Scale 1 : 9,000,000 or 142 stat. miles to an inch. Ernest Leroux, Paris.

This map is published as a supplement to the atlas of the Mission of Dutreuil de Rhins in Central Asia. In addition to the ethnographical colouring, commercial routes, both modern and ancient, are laid down.

Japan. **The Welcome Society of Japan.**

Map of Japan for tourists. Published by the Welcome Society of Japan, Tokyo.

Philippine Islands. **U.S. War Department.**

(1) Carta General del Archipiélago Filipino. Scale 1 : 1,400,000 or 22·1 stat.

miles to an inch. Chofré y Compa., Manila, 1897. Reproduced under the direction of Brigadier-General A. W. Greely, for use of the Signal Corps, U.S.A., 1899.
(2) Map of Manila and vicinity, showing positions of troops prior to the battle of February 5, 1898, and location of the military telegraph lines then in operation; also positions and locations after the capture of Caloocan, February 10. Scale 1: 25,000 or 0·4 stat. mile to an inch. Prepared under the direction of Lieut.-Colonel R. E. Thompson, by J. H. Watkins, Sergt. Vol. Signal Corps, Manila. 1899.

(3) Map of the operations against Manila, 1898. Compiled and drawn under supervision of Lieut.-Colonel R. E. Thompson, C.S.O., by J. H. Watkins, Sergt. Vol. Signal Corps. Scale: 0·18 stat. mile to an inch. Office of Chief Signal Officer. Dept. of Pacific and 8th A.C. *Presented by Brigadier-General A. W. Greely.*

The maps have been published under the direction of Brigadier-General A. W. Greely, Chief Signal Officer U.S. Army, for the use of the United States officers employed in Philippine campaign.

AMERICA.

Cuba. **U.S. War Department.**

Military Telegraph Lines operated by the Signal Corps, U.S. Army in Cuba. Scale 1 : 300,000 or 4·7 stat. miles to an inch. Prepared under the direction of Brigadier-General A. W. Greely, Chief Signal Officer U.S. Army, by Colonel H. H. C. Dunwoody, 1899. Washington, D.C. 2 sheets. *Presented by Brigadier-General A. W. Greely.*

Cuba. ———

Map of Cuba, showing telegraph lines. A. B. Graham, Photo. Lith., Washington, D.C.

Puerto Rico. **U.S. War Department.**

Military Map of the Island of Puerto Rico, 1898. Scale 1 : 253,440 or 4 stat. miles to an inch. Drawn by W. Morey, Jr., C.E. Adjutant-General's Office, Military Information Division, Washington, D.C. *Presented by Lieut. Grant Squires.*

GENERAL.

World. **Meyer.**

Meyer's Hand-Atlas. Zweite, neubearbeitete und vermehrte Auflage mit 112 Kartenblättern, 9 Textbeilagen und Register aller auf den Karten verzeichneten Namen. Parts 2 to 14. Leipzig und Wien. Verlag des Bibliographischen Instituts, 1899. *Price 30 pf. each part.*

World. **Vivien de Saint Martin and Schrader.**

Atlas Universel de Géographie. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Paris: Librarie Hachette et Cie. Sheet: Amérique du Nord. Physique. *Price 2 fr.*

This sheet is orographically coloured in five tints, showing elevations from sea-level to above 2000 metres. The depths of the ocean are shown in different shades of blue, at intervals of 1000 metres; soundings in the deeper basins are also given in figures. The latest reliable material has evidently been used in the compilation of this map, and the style in which it is drawn leaves nothing to be desired.

CHARTS.

United States Charts. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic and Pacific Oceans for July, 1899. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Morocco. **Smith.**

Twenty Photographs of Morocco, taken by W. W. Hind Smith, Esq. *Presented by W. W. Hind Smith, Esq.*

This series of photographs appears to have been taken with a small hand-camera. The subjects are well chosen, and as they are remarkably clear, they would well bear enlargement. The following is a list of the titles:—

(1) A Moor of Tangier; (2) Moorish country house; (3) Women carrying wood; (4) A saint's tomb; (5) Patron saint's tomb, Tetuan; (6) Market-place, Tetuan; (7) Market scene at Tetuan; (8) Spaniards firing at effigy of Judas in Tetuan at Easter;

(9) Interior of Moorish room, Tetuan; (10) Entrance to mosque, Tetuan; (11) Street scene, Tetuan; (12) Grain market, Tetuan; (13) Moorish house and garden, Tetuan; (14) Tetuan, looking towards the Kasboh; (15) Moorish village girl; (16) Boys at a camp; (17) Camp at Harrarish; (18) Tangier Sôko (market); (19) Mode of travel; (20) El Jezeed and boy.

Venezuela. **Paterson.**

Forty-five Photographs of Venezuela, taken by Major Stanley Paterson. *Presented by Major Stanley Paterson.*

This is a series of views taken by Major Stanley Paterson on the Orinoco river, the titles of which are given in the following list:—

(1) View in the delta: Guaraunos canoe; (2) View in the delta: Guaraunos canoe; (3) View in the delta, Guaraunos canoe; (4) Guaraunos village, delta of the Orinoco; (5) Barrancas; (6) Government House, Ciudad Bolivar, residence of the President of the State of Guayana; (7) Venezuelan officers, Ciudad Bolivar; (8) The President's guard, Bolivar; (9) President's guard, Bolivar; (10) Barrack guard, Bolivar; (11) Urbana, Rio Orinoco; (12) Rio Orinoco near Carriben: Venezuelan canal; (13) View of the banks of the Orinoco near Urbana, showing gradual detrition; (14) Rock at Castillito, Rio Orinoco; (15) Mogoti rock, Rio Orinoco, between Urbana and Carriben; (16) Mouth of the Cabulliane; (17) Perico; (18) The Orinoco at Salvajito; (19) The forest on fire, La Garcita between Salvajito and Maipures; (20) Randal de Guahibos; (21) Randal de Guahibos; (22) Portage of a "piragua" over the Randal de Guahibos; (23) View on the Tuparro river; (24) The steamer *Meta* on the rocks near the mouth of the Tuparro river; (25) The Orinoco at Maipures; (26) Cerromono between Maipures and Mundrapo; (27) View near the mouth of the Sipapo river, showing part of the sacred mountain of the Piaroas Indians, Mount Sipapo; (28) Piaroas Indians in canoes near the mouth of the Sipapo river; (29) My "bonga," or dug-out: a rest for food; (30) Mouth of the Rio Vichada; (31) A Venezuelan house at Mundrapo; (32) Piaroas Indian women (civilized), Mundrapo, Rio Orinoco; (33) A rock between Mundrapo and San Fernando, showing the high-water mark; (34) Indians preparing rubber, Nericagua, Rio Orinoco; (35) A half-caste "gommero," or rubber-gather, and family, Guaniana, Rio Guaviare; (36) Gommeros "barraca," or hut, Guanayana; (37) San Fernando from the Atabapo; (38) San Fernando de Atabapo: river front; (39) A lane in San Fernando de Atabapo; (40) "Pia poca" (the Toucan), my Guahibo Indian boy, San Fernando de Atabapo; (41) Venezuelans and Guahibos at San Fernando de Atabapo; (42) Junction of the Atabapo and Guaviare rivers near San Fernando de Atabapo; (43) Indians carrying manioc, Rio Atabapo; (44) Indian hut, Marocoti, near San Fernando de Atabapo; (45) Enormous Cerba tree near Morocoti, Rio Guaviare.

West Africa. **Johnston.**

Sixteen Photographs of Sierra Leone and the Gold Coast, taken by W. S. Johnston, Esq. *Presented by Rev. F. G. Snelson, M.A., Ph.D.*

These photographs illustrate the scenery of the west coast of Africa in the Sierra Leone and Gold Coast colonies, in addition to which there are some groups of natives. The titles are given below.

(1) The reservoir inside the Victoria Park, Freetown, Sierra Leone; (2) Native artillery, Freetown; (3) The procession to the court house after the assize service (Judge Bruce Hindle): Freetown, 1896; (4) Princess Christian Cottage Hospital (back view), Freetown; (5) Kru Town road, Freetown; (6) Congo Town, Sierra Leone; (7) Cape Sierra Leone and the lighthouse; (8) The fort, Chama, Gold Coast; (9) Tarkwa village (gold-mining district), Gold Coast; (10) Axim, Gold Coast; (11) St. George's castle, Elmina, Gold Coast; (12) Cape Coast Castle, Gold Coast; (13) Chief Coker, Cape Coast; (14) Fort William lighthouse, Cape Coast; (15) Bonthe, Sherboro; (16) no title.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

MAP O

UGANDA PROT

AND THE TERRITORIES

EXPLORED BY THE MACDONALD

Routes traversed by the Expe

Scale of Miles

0 20 40 60 80 100

30 31 32 33

6 5 4 3 2 1 0 1

oBor

R. NILE

Lado

Swamp

BERRI

Beden

LANGI

Obbo

Agoro 5400

Tertenia

Akol

Kitgum

Dufile

Fadibek

Jefi

Faloro

R. Akoro

R. Bagger

Turkan

Umia

Fatiko

LIRA

Wadelai

R. Udat

LOBO

LENDU

R. NILE

Fajao

Fowera

OR

LAKE ALBERT

L. RWANIA

WAKEDI

Masindi

Mruli

Kiboro

Stanley's Camp

Hoima

L. CHOGA 3329

R. Dubanga

Kabagenge

Bandali

Kilangali

GABULA

R. Kafu

R. Nowasi

R. Kitumbi

R. Mpanga

R. Mpasa

Bula

Hakoga

Nakabimba

Pt Roddy

Pt Gerry

Ruwenzori

TORU

Bwekula

Matiana

Kampala

Entebbe

Kyaliguma

Port Alice

Uvuma

Ugaya

Kome

Pt Grant

Pt George

Lusidasi

L. Albert Edward

Kabula

Kasambia

Masaka

SESSE Is

ANKOLE

Kibasa

Kiwatira

KOKI

Kanswaga

Kakuto

LAKE VICTOR

Kitangole

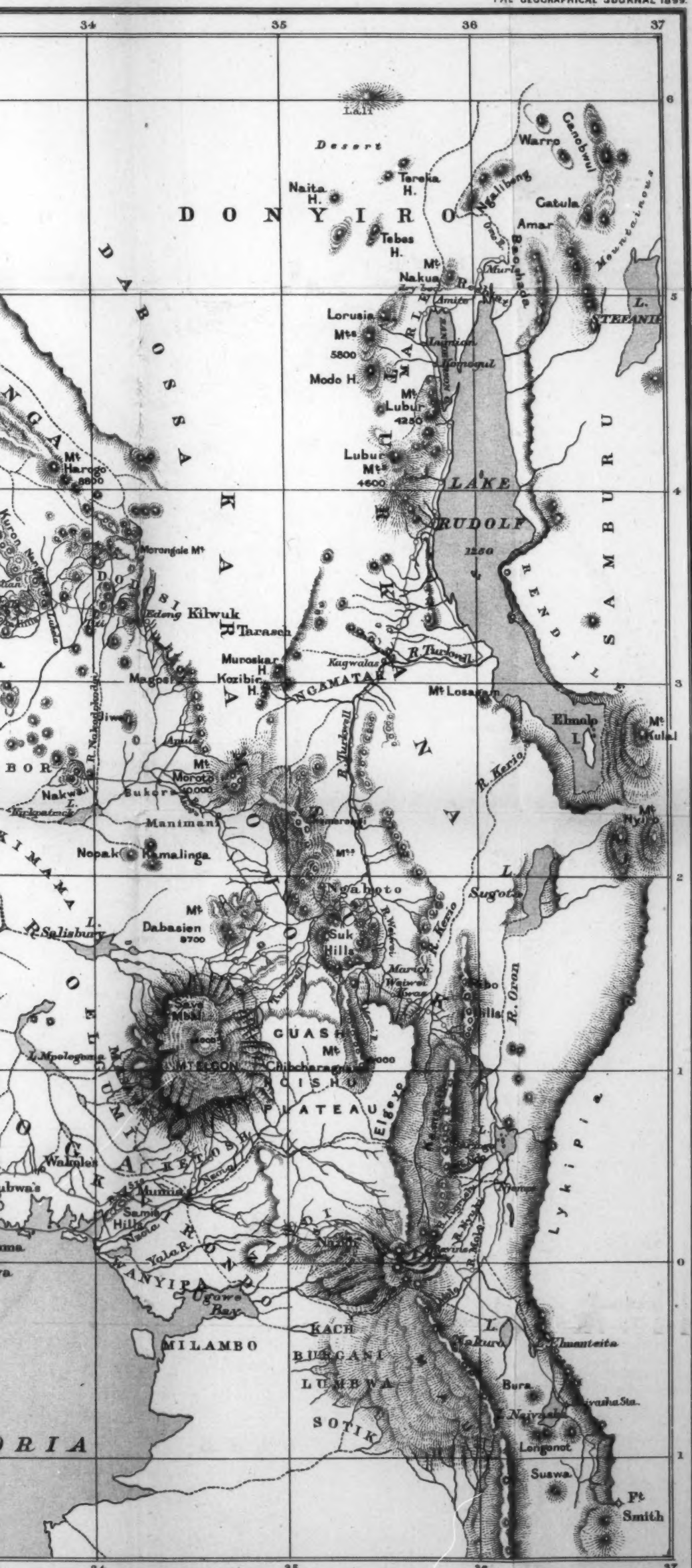
Published by the Royal Ge

OF

TECTORATE

S TO THE NORTH

LD EXPEDITION 1897-1898.

Expedition. ——

Natural scale 1:2,500,000 or 39·5 miles = 1 inch.